Draft Screening Level Ecological Risk Assessment (SLERA) Operable Unit 1

Quanta Resources Site Edgewater, New Jersey

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March 2006

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Executive Summary

This draft Screening Level Ecological Risk Assessment (SLERA) for the Quanta Resources Site* Operable Unit 1 (OU1) has been prepared in accordance with the requirements of the United States Environmental Protection Agency (USEPA) Administrative Order on Consent (AOC) II-CERCLA-2003-2012 for the Uplands Area, Operable Unit (OU) 1, entered into by Honeywell International, Inc. (Honeywell), and the Quanta Site Administrative Group (QSAG) on November 4, 2003.

Consistent with the AOC, the approach presented in the USEPA-approved Remedial Investigation (RI/FS) Work Plan (Parsons, 2005) and the Exposure Scenario Technical Memorandum (CH2M HILL, 2005), this SLERA was conducted to evaluate whether or not historical chemical constituent releases at OU1 represent a potential risk to exposed terrestrial flora and fauna. The overall objective of the SLERA is to evaluate whether contaminants present at OU1 represent a potential risk to ecological receptors.

The methods and approaches used in this SLERA were developed from USEPA Ecological Risk Assessment (ERA) guidance (USEPA 1997a, 1998). In particular, this SLERA consists of Steps 1, 2, and the first part of Step 3 of the 8-step ERA process (USEPA, 1997a, 1998). Step 1 consists of problem formulation, Step 2 consists of analysis and risk characterization, and the first part of Step 3 consists of refinement of conservative screening assumptions and refined risk characterization.

The spatial extent of the ERA encompasses terrestrial habitat found on OU1. Potential impacts to aquatic habitat in the Hudson River (OU2) are not considered in this ERA. The SLERA evaluates potential risk to terrestrial receptors from exposure to compounds detected in surface soil samples collected at OU1. Risk was only evaluated for the 15-acre Quanta Resources property as neighboring properties are heavily developed with no habitat. Observations of habitat on the Quanta Resources property indicated a disturbed urban old field community with some shrubs and small trees. Portions of the Quanta Resources property are paved and the overall quality of the habitat is low. No sensitive habitat and no state or federal listed threatened or endangered terrestrial species were identified within a one mile radius of the site. Several birds typical of urban environments were noted on the property. No mammals were observed at OU1.

The potential for ecological risk was evaluated through direct exposure of receptors to soil and by modeling risk from exposure via ingestion of soil and contaminated food or prey items. Media-specific soil screening values (expressed as concentrations within a media) that are protective of plant and invertebrate communities were used to evaluate risk from direct exposure to chemicals in surface soil. Using conservative exposure scenarios potential risk was indicated for plant and invertebrate receptors from exposure to concentrations of metals, semivolatile organic compounds (SVOCs), and volatile organic compounds (VOCs) in soil.

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* As defined in the Administrative Order on Consent (AOC) II-CERCLA-2003-2012, the Site includes the former Quanta Resources property, located on River Road in Edgewater, New Jersey, and any areas where contamination from the property has come to be located.

Risk to higher order receptors was evaluated via the ingestion pathway using food chain models to estimate an exposure dose. The estimated dose was compared to reference toxicity values to evaluate potential risk. Higher order receptors that were evaluated via food chain exposure included several small mammals (shrew, vole, mouse, and weasel), raccoon, red-tailed hawk, and American robin. The SLERA food chain models indicated risk to one or more of the higher order receptors from exposure to metals, polychlorinated biphenyls (PCBs), and SVOCs in food or prey items.

At the completion of the SLERA (Step 2) several Constituents of Potential Concern (COPCs) were identified in soil that may pose risk via direct contact or food chain exposure to terrestrial receptors at OU1. As specified by USEPA guidance the SLERA was completed using conservative assumptions. To provide additional perspective on the indicated risk the screening and food chain modeling was re-done using less conservative assumptions (Step 3 of the ERA process). For example, mean concentrations of site contaminants were used in the screening and modeling instead of maximum concentrations. Mean, median or midpoint exposure factors were used in the food chain models instead of maximum values (i.e. mean instead of maximum ingestion rate).

Using refined assumptions, direct exposure risk was indicated for plant and invertebrate receptors based on exposure to metals, SVOCs, and VOCs in soil. The list of direct exposure COPCs was reduced in number using the refined assumptions.

The refined food chain modeling indicated the potential for risk for the shrew, white footed mouse, and the meadow vole from exposure to PCBs and PAHs in food and prey items. Food chain risk was not indicated for the avian receptors and the raccoon using the less conservative model inputs.

The results of this SLERA and the Step 3 refinement work indicate the potential for risk but include many conservative assumptions and uncertainties. Uncertainties associated with this SLERA include a lack of site specific data such as chemical form and bioavailability, actual occurrence of selected receptors on site, and use of literature based toxicity values instead of site specific toxicity or tissue data. To address uncertainty additional studies and data collection could be completed at OU1. However, based on the location of this site in the center of a very urban area it is unlikely that many receptors actually inhabit OU1. The fact that OU1 will be remediated and most likely developed precludes the need for additional characterization of ecological risk, especially when ecological receptors may not permanently inhabit OU1 and little or no habitat is expected to exist after development.

Based on recent adjacent property redevelopment, community growth, community and land owner interests, redevelopment is expected, but no plans have been publicly announced to date. Potential ecological risk identified in this risk assessment will be considered in the future Feasibility Study (FS) process, as appropriate.

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Acronyms and Abbreviations

µg	Micrograms
4,4′-DDD	4,4′-Dichlorodiphenyldichloroethane
4,4′-DDE	4,4′-Dichlorodiphenyldichloroethylene
4,4′-DDT	4,4′-Dichlorodiphenyltrichloroethane
AST	Aboveground Storage Tank
ATSDR	Agency for Toxic Substances and Disease Registry
AUF	Area Use Factor
BAF	Bioaccumulation Factor
BCF	Bioconcentration Factor
BERA	Baseline Ecological Risk Assessment
BTAG	Biological Technical Assistance Group
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
BW	Body Weight
COPC	Chemical of Potential Concern
DI	Dietary Intake for Chemical
EFH	Essential Fish Habitat
ERA	Ecological Risk Assessment
FC	Concentration of Chemical in Food Item
FIR	Food Ingestion Rate
GD	Gestation Days
HQ	Hazard Quotient
HSDB	Hazardous Substance Data Bank
kg	Kilogram
K_{ow}	Octanol-water partition coefficient
L	Liter
LD	Lactation Days
LOAEL	Lowest Observed Adverse Effect Level

mg	Milligram
MSPE	Ministry of Housing, Spatial Planning and Environment
NJDEP	New Jersey Department of Environmental Protection
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No Observed Adverse Effect Level
ORNL	Oak Ridge National Laboratory
OU1	Operable Unit 1
OU1	Operable Unit 1
OU2	Operable Unit 2
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PDF	Proportion of Diet Composed of Food Item
PDS	Proportion of Diet Composed of Soil
ppt	Part Per Thousand
RDCSCC	Residential Direct Contact Soil Cleanup Criteria
RI/FS	Remedial Investigation/Feasibility Study
RSI	Removal Site Investigation
SC	Concentration of Chemical in Soil
SLERA	Screening-level Ecological Risk Assessment
SMDP	Scientific Management Decision Point
SVOC	Semi-Volatile Organic Compound
TCLP	Toxicity Contaminant Leaching Procedure
TPH	Total Petroleum Hydrocarbon
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFW	U.S. Fish and Wildlife Service
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WC	Concentration of Chemical
WIR	Water Ingestion Rate

SECTION 1

Introduction

This Screening Level Ecological Risk Assessment (SLERA) for the Quanta Resources Site* (the "Site") Operable Unit 1 (OU1) has been prepared in accordance with the requirements of the United States Environmental Protection Agency (USEPA) Administrative Order on Consent (AOC) II-CERCLA-2003-2012 for the Uplands Area, Operable Unit (OU) 1, entered into by Honeywell International, Inc. (Honeywell) and the Edgewater Site Administrative Group (ESAG) on November 4, 2003. Surface water and sediment in the Hudson River adjacent to the OU1 comprise OU2, and are being investigated separately.

Consistent with the approach presented in the USEPA-approved Remedial Investigation (RI/FS) Work Plan (Parsons, 2005) and the Exposure Scenario Technical Memorandum (CH2M HILL, 2005), this SLERA was conducted to evaluate whether or not historical chemical constituent releases at OU1 represent a potential risk to exposed terrestrial flora and fauna. The overall objective of the SLERA is to evaluate whether contaminants present at OU1 represent a potential risk to ecological receptors.

SLERA Approach

The methods and approaches used in this SLERA were developed from USEPA ERA guidance (USEPA 1997a, 1998). In particular, this SLERA consists of Steps 1, 2, and the first part of Step 3 of the 8-step ERA process (USEPA, 1997a, 1998). Step 1 consists of problem formulation, Step 2 consists of analysis and risk characterization, and the first part of Step 3 consists of refinement of conservative screening assumptions and refined risk characterization. The spatial extent of the ERA encompasses terrestrial habitat found on OU1. Potential impacts to aquatic habitat in the Hudson River (OU2) are not considered in this ERA.

Step 1, screening-level problem formulation, involves: (1) compiling and reviewing existing information on the habitats and biota potentially present on OU1 and in OU1 vicinity; (2) compiling and reviewing available analytical data; (3) developing exposure scenarios; (4) developing an ecological conceptual model that identifies and evaluates potential source areas, transport pathways, fate and transport mechanisms, exposure media, exposure routes, and receptors; and (5) developing assessment and measurement endpoints for all complete exposure pathways.

Step 2, analysis and risk characterization, involves two components: analysis and risk characterization. The principal activity associated with the screening-level effects assessment is the development of chemical exposure levels that represent conservative thresholds for adverse ecological effects. The screening-level exposure assessment involves estimating potential exposures to ecological receptors for the exposure scenarios identified

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* As defined in the Administrative Order on Consent (AOC) II-CERCLA-2003-2012, the Quanta Resources Superfund Site includes the former Quanta Resources property, located at 163 River Road in Bergen County, Edgewater, New Jersey, and any areas where contamination from the property has come to be located. The current extent of the Quanta Resources property (referred to herein as the "Quanta Resources property") refers to Block 95, Lot 1 as defined on the Borough of Edgewater, New Jersey tax map.

in the screening-level problem formulation using intentionally conservative assumptions. The principal activity associated with the screening-level exposure assessment is the estimation of chemical concentrations in applicable media to which the receptors might be exposed based upon maximum (worst case) assumptions. The screening-level risk calculation represents the risk characterization portion of the SLERA and uses the information generated during Step 1 (problem formulation and analysis) to calculate potential risks to ecological receptors for the exposure scenarios evaluated. Also included is an evaluation of the uncertainties associated with the models, assumptions, and methods used in the SLERA, and their potential effects on the conclusions of the assessment.

At the conclusion of Step 2 is a Scientific Management Decision Point (SMDP), at which point four decisions are possible:

- There is enough information to conclude that no unacceptable ecological risks exist and therefore there is no need for further study or actions to address ecological risk;
- The available information is not adequate to estimate risk or the risk estimate is believed to be too conservative or uncertain for decision-making purposes. The ecological risk assessment process should proceed to the Baseline ERA (Step 3);
- The available information indicates a potential for adverse ecological effects, and a more thorough study is necessary to refine the risk estimates (proceed to Step 3); or
- There is adequate information to conclude that unacceptable ecological risks exist and remedial actions should be considered (presumptive remedy).

The first part of Step 3 refines the potential risk evaluation using more realistic assumptions than the conservative assumptions used in Steps 1 and 2. Based on the outcome of the SLERA, recommendations are made about the need for additional investigation. If the results of the SLERA suggest that further ecological risk evaluation or data collection is warranted for a particular site, the ERA process would proceed to the baseline ERA (BERA), which is a more detailed phase of the ERA process (Steps 3 through 7).

1.1 Background and Previous Investigations

1.1.1 Site Description

OU1 is located adjacent to the western side of the Hudson River, directly west of Manhattan (Figure 1-1). The Quanta Resources property of OU1 covers approximately 15 acres and was bisected in 1995 and 1996 by the realignment of River Road, which now runs north–south through the western portion of OU1. A portion of OU1 is located between Old River Road and River Road (Block 93, Lot 3). According to the 2004 Preliminary Assessment report (O'Brien & Gere, 2004) for this area, Block 93, Lot 3 is part of OU1 and consists of a grassy area with portions of a concrete wall at the southern end. Historical documents indicate that there were two 1,000-gallon underground storage tanks (USTs) in the center of Lot 3 that may still exist. One aboveground storage tank associated with operations at OU1 was in Lot 3 and was reported to have contained waste oil. A subsurface structure with a manhole is in the southern portion of Lot 3 and may be a former wastewater discharge point or separator (O'Brien & Gere, 2004).

The Quanta Resources property is vacant. There are exposed tank and building foundations at several locations at OU1. The property also includes the remains of a former oil–water separator, a wooden bulkhead along the edge of the Hudson River, and the remains of wooden docks. A chain-link fence is maintained around the portion of OU1 east of River Road, except for the boundary with the Hudson River. Warning signs are posted at locations around OU1. The property is inspected monthly to verify the integrity of these land-use controls and to make any necessary repairs. Oil-absorbent booms are maintained in the Hudson River to contain oil migrating to surface water from soil, groundwater, or sediment. The booms are inspected periodically, and oil-saturated booms are removed and containerized for offsite disposal.

All land surfaces surrounding the Quanta Resources property are paved or covered by large buildings. The properties immediately surrounding OU1 are zoned for mixed industrial, commercial, and residential uses. The Quanta Resources property is bordered on the north by the Edgewater Enterprises and Lustrelon properties. Both are undergoing redevelopment with commercial and residential structures. More specifically to the north the Quanta Resources property is bordered by the Promenade at City Place development on the Edgewater Enterprises property (the former Celotex Industrial Park). The Promenade at City Place complex contains a mixture of residential and commercial properties. Construction is underway for a mid-rise apartment building and a series of townhouses.

Bordering the Quanta Resources property to the south is the 115 River Road, LLC office complex. The property currently includes parking, offices, a bank, and a day-care center. South of the 115 River Road, is the Lever Brothers property, formerly occupied by Unilever Research. The Lever Brothers property is bordered on the east by the Hudson River and on the west by Old River Road (Figure 1-2).

This SLERA only evaluated risk on the vacant Quanta Resources property as no habitat is present on adjacent properties. It should be noted that while the Quanta property is undeveloped at this time, it is expected that the property will eventually be developed similar to the adjacent properties.

1.1.2 Surrounding Property Descriptions

Edgewater Enterprises and Lustrelon

The properties immediately surrounding OU1 are zoned for mixed industrial, commercial, and residential uses. The Quanta Resources property is bordered on the north by the Edgewater Enterprises and Lustrelon properties (Figure 1-2). Both are undergoing redevelopment with commercial and residential structures. The Quanta Resources property is bordered to the north by the Promenade at City Place development on the Edgewater Enterprises property (the former Celotex Industrial Park). The Promenade at City Place complex contains a mixture of residential and commercial properties with several retailers at ground level, residential units (both owner occupied and rentals) above, and a 122-room hotel. Construction is underway for a mid-rise apartment building and a series of townhouses.

115 River Road, LLC and Lever Brothers

Bordering the Quanta Resources property to the south is the 115 River Road, LLC office complex. The property currently includes parking, offices, a bank, and a day-care center. South of the 115 River Road, LLC property is the Lever Brothers property, formerly occupied by Unilever Research. The Lever Brothers property is bordered on the east by the Hudson River and on the west by Old River Road (Figure 1-2).

Block 93, Lots 1, 2, and 3

Three lots on Block 93 (Lots 1, 2, and 3) are located between Old River Road and River Road, although only Lot 3 is believed to have been part of the former Quanta Resources operations The Three Y, LLC property consists of Lots 1 and 2. Lot 2 is a former railroad right-of-way that is partially paved. There is a solid waste dumpster, old vehicles, portions of a chain-link fence, and remnants of railroad track on Lot 2. A partially paved parking area and two-story restaurant are located in the southwest corner of Lot 1. Remnants of a building foundation, construction vehicles, and old vehicles are located near the southeast corner of the lot. The remainder of the lot consists of a grassy area with an old food concession (O'Brien & Gere, 2004).1.1.2 Site History

From approximately 1876 to 1967, OU1 was used to manufacture coal tar, paving, and roofing materials. Sanborn fire insurance maps from 1900 to 1944 identify the property as the "Barrett Company's Shadyside Plant, Manufacturers of Tar Products." Allied Chemical Corporation Asphalt Division (now Honeywell) took over operations of the coal tar distillation plant in the early 1930s. The tar-processing plant was on the Quanta Resources property and the southern portion of the Edgewater Enterprises property. The plant operated until 1974, when the property was sold to the estate of James Frola and Albert Von Dohln. In 1977 the property was leased to E.R.P. Corporation for the storage and recycling of oil. The lease was assigned to Edgewater Terminals, Inc., and then transferred to Quanta Resources Corporation in July 1980. The property contained 61 aboveground storage tanks, at least 10 USTs, septic tanks, and underground piping. The tanks' total storage capacity was over 9 million gallons.

The NJDEP ceased facility operations at OU1 in 1981 after it was discovered that large quantities of oil were present in storage tanks at the facility, including some with concentrations of PCBs. On October 6, 1981, Quanta Resources Corporation filed for bankruptcy, after which the property was no longer in use. Periodic flooding of the Hudson River, equipment failures, freezing and thawing of pipes and tanks, rusted values valves and seams, and the lack of containment structures, and the migration of NAPL resulted in releases. NJDEP requested that USEPA address Site contamination pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Several removal actions were conducted by Honeywell at OU1 from 1984 to 1988 under USEPA oversight. Approximately 1.35 million gallons of oil were removed for offsite treatment. Over 1.5 million gallons of coal tar and petroleum/oily wastes were removed from storage tanks and recycled. In addition to storage tanks, some shallow soil and underground piping was removed. The removal actions were assessed by USEPA in 1992 through the collection and analysis of soil, sediment, and groundwater samples from OU1. Additional investigations conducted prior to and subsequent to the removal actions are described in Section 1.4.3.

After intermittent sheens became visible at the waterfront in 1997, USEPA issued an order to Honeywell mandating that it build an interception trench to prevent oil from continuing to seep to the Hudson River. Prior to submission of the final trench design, USEPA changed the approach as a result of the discovery that oil seeps may be present on properties adjacent to OU1 in addition to Site itself. Honeywell entered into an AOC with USEPA in 1998 to conduct a Removal Site Investigation (RSI) and prepare an engineering evaluation/cost estimate to characterize Site conditions and to develop a solution to the seeps. The engineering evaluation/cost estimate was submitted in 1999 and recommended the construction of two trenches to collect light and heavy oil fractions prior to their migration and release into the Hudson River (GeoSyntec, 2001).

In February 2000, USEPA rejected the engineering evaluation/cost estimate recommendation because USEPA did not believe that the trench as designed would be effective. The letter recommended that additional, more-effective alternatives or technologies be evaluated, and that an ecological evaluation be conducted for the tidal mud flats of the Hudson River.

On September 9, 2002, USEPA placed OU1 on the National Priorities List. In 2004, Honeywell and USEPA agreed that an RI/FS would be conducted to fill data gaps in previous investigations and provide a basis for a complete evaluation of alternatives. In May 2005, an RI/FS Work Plan (Parsons, 2005) was submitted to, and approved by, USEPA for OU1.

1.1.3 Adjacent Property History

Edgewater Enterprises

The Edgewater Enterprises property (former Celotex Industrial Park) is just north of the Quanta Resources property (Figure 1-2). This Edgewater Enterprises property has been the site of a chemical plant, gypsum company, vacuum truck company, and metal reclaiming/refinishing plant. The chemical plant, General Chemical Company, operated on the southern portion of the property from at least 1900 to 1957. The chemical plant was used to produce acids, alums, sodium compounds, and sulfuric acid using a lead chamber process (Parsons, 2005). A gypsum company and a vacuum truck company have also occupied the Edgewater Enterprises property, and after 1974 a metal-reclaiming and - refinishing plant was operated on the southern portion of the property. Stained areas and indicators representative of a discharge to the Hudson River were identified in historical aerial photographs and may have been associated with the plant. Former operations at these areas of the Edgewater Enterprises property may have contributed to the presence of constituents similar to those detected at OU1. Between 1986 and 1989, approximately 8 ft of fill material appears to have been placed on the Edgewater Enterprises property (Environ, 2005 Additional fill material (more than 8 feet) was recently placed on the southeastern side of the Edgewater Enterprises Property adjacent to the Quanta Resources property, and this area has been developed as a parking lot. Redevelopment of this property is ongoing and attempts are currently being made to further define the northern extent of coal tar as part of this process.

Lustrelon, 115 River Road, LLC, and Lever Brothers

Detailed site history information was not available for these neighboring properties. Available information indicates that the former Lustrelon property (just north of the Edgewater Enterprises property) was the site of a lacquer spray paint and parts-cleaning operation and a raw materials warehouse. The 2000 RSI indicated that linseed oil was manufactured at the 115 River Road, LLC property (former Spencer-Kellogg facility). Sanborn Insurance maps and other historical data will be reviewed and additional information included in the RI report for OU1.

Block 93, Lot 1 (Three Y, LLC property)

The current building on the Three Y, LLC Block 93, Lot 1 property was reportedly used as a quality control laboratory by AlliedSignal until 1974. The building remained vacant for approximately 10 years, after which it was used for miscellaneous purposes (as an office, for storage, and as a musical rehearsal studio) and then converted to a restaurant in the early 1990s. The restaurant is now closed.

Block 93, Lot 2 (Three Y, LLC property)

This Block 93, Lot 2 historically included railroad tracks used by AlliedSignal and Faesy & Besthoff for chemical shipping and receiving. This portion of the property was owned by the New York, Susquehanna and Western Railway Corporation. The tracks were removed, reportedly in 1988, and the lot was subdivided. The northern portion of the lot was acquired by James Frola in 1988, who sold the property to Thomas Heagney in 1999. The southern portion of Lot 2 was purchased from the railway by Anthony Besthoff in 2003 (O'Brien & Gere, 2004).

1.1.4 Previous OU1 Investigations

Products stored at the former Quanta Resources property included coal tar, waste oils (some containing PCBs), asphalt. As a result of historical site operations, precipitation, and flooding, soil and groundwater at OU1 has been impacted by various chemical constituents. Summaries of some past investigations conducted at OU1 to identify or delineate contamination are provided below.

1990 Soil Investigation (PS&S, 2002)

A 1990 soil investigation conducted by PS&S included the collection of 11 soil samples from eight soil borings throughout OU1. Samples were collected from the 0.0-to-0.5-ft interval from all borings, and from the 4-to-6-ft interval in three of the borings. All samples were analyzed for USEPA priority pollutants (40-peak library search) and total petroleum hydrocarbons (TPH). Arsenic, lead, mercury, thallium, and zinc were detected above 2002 NJDEP Residential Direct Contact Soil Cleanup Criteria (RDCSCC). Benzene was the only volatile organic compound (VOC) detected above RDCSCC, although both benzene and total xylenes exceeded the Impact to Groundwater Soil Cleanup Criteria in at least one location. Detected base neutral organic compounds, predominantly polycyclic aromatic hydrocarbons (PAHs), generally exceeded RDCSCC. TPH was detected at concentrations up to 38,000 mg/kg. Pesticides were detected in six samples, one of which exceeded RDCSCC. PCBs were not detected during this investigation.

1992 and 1995 USEPA Site Assessments (Parsons, 1999)

The 1999 Summary Report indicates that USEPA assessments in 1992 and 1995 documented contamination of surface and subsurface soil, Hudson River sediments, and Site groundwater. Contaminants included arsenic, asbestos, benzene, metals, PAHs, TPH, and other VOCs.

1997 Pre-Design Investigation (Parsons, 1997)

A pre-design investigation was conducted in March 1997 at OU1 to fill certain data gaps. Five soil samples were collected in the vicinity of a former hot spot and analyzed for PCBs, TPH, and the toxicity characteristic leaching procedure (TCLP). In addition, insulation material in two boilers in the onsite building was sampled for asbestos, a magnetometer survey was conducted to identify two potential USTs, and a property and topographic survey was conducted. PCBs were detected in all soil samples at concentrations from 0.38 to 3.65 mg/kg. TPH was detected in all five samples, with diesel range concentrations up to 8,600 mg/kg. TCLP volatiles were not detected in any sample, and lead was detected below the regulatory limit of 5 mg/L (Parsons, 1997). Asbestos was detected in the insulation material from both boilers. The magnetometer survey failed to locate the two suspected USTs because of interference from reinforced concrete. The report recommended no action on the basis of PCB, TPH, or TCLP results. Removal of asbestos material from the boilers and excavation of the test pit to locate the suspected USTs were recommended.

1998 Pre-Design Investigation (Parsons, 1998)

Additional pre-design investigations were conducted in July, August, and September 1997 to obtain information pertaining to the suspected USTs and underground piping referenced in the 1997 predesign investigation report and to gather information concerning any shallow low-permeability units near the proposed location of the planned recovery trench. Eleven test pits were completed and 14 soil borings were advanced in the eastern portion of the Quanta Resources property. One groundwater sample was collected from a test pit and analyzed for VOCs, semi-volatile organic compounds (SVOCs), and TCLP. Results of these analyses were not provided in the data report. No USTs were located during test pit activities, although several steel pipes were encountered. The clayey silt layer in the vicinity of the proposed recovery trench was encountered between 10 to 12 ft bgs. Sanborn fire insurance maps for OU1 were obtained as part of this investigation but were not discussed in the report.

2000 Soil Investigation (PS&S, 2002)

The June 2000 Soil Investigation included the collection of 18 soil samples from 10 borings in the northwest corner of the Quanta Resources property near its border with the Edgewater Enterprises property. Samples were typically collected from 0.5 and 3.5 ft below grade. All samples were analyzed for arsenic, and five samples were also analyzed for other metals, VOCs, SVOCs, PCBs, and pesticides. The 2002 Supplemental Data Submission document indicated that elevated concentrations of arsenic relative to general Site conditions were reported in several borings, particularly in the subsurface samples from those borings. Several other metals were detected above RDCSCC in one or more samples. PAH data were consistent with other Site data, and no VOCs, PCBs, or pesticides exceeded NJDEP screening criteria (PS&S, 2002).

2000 Removal Site Investigation (GeoSyntec, 2000)

The RSI was conducted to

> *... (i) identify possible conduits for the transport of coal tar product from sources areas to the Hudson River; (ii) delineate source areas which continue to impact soil, river sediment, and groundwater; (iii) characterize the nature and extent of soil, river sediment, and groundwater contamination; and (iv) provide data on the geotechnical properties of the [Site] soils in support of evaluation of engineered site remedies.*

The scope of work included test trenching and a geophysical survey, soil boring advancement, cone penetrometer testing, sediment sampling, monitoring well installation and groundwater sampling, and a geotechnical engineering evaluation. Field activities were conducted in 1998 and 1999, including completion of 17 test trenches, 14 soil borings, 10 monitoring wells, and 23 cone penetrometer test/Rapid Optical Screening Tool (ROST™) locations. Nine surface soil samples, 26 sediment cores, and 10 deeper Vibracore sediment samples were collected. Ten penetrometer test/ROST™ locations were completed in sediment. Twenty existing groundwater monitoring wells and eight of the 10 new monitoring wells were sampled during the RSI. Surveying and tidal fluctuation monitoring was also conducted.

The report concluded the following with respect to OU1:

Soil: Soil samples supplemented previous collected data to delineate the extent of COIs (PAHs, arsenic, chromium, and lead) in soil. Arsenic, chromium, and lead were detected at scattered locations across OU1, which indicted that metals contamination is limited to releases in localized areas and is not widespread. PCB detections were limited to soils in the former transformer locations. PAHs were detected throughout soil at OU1, but elevated concentrations were limited to source areas. A significant amount of soil data from the Edgewater Enterprises and Lustrelon properties were obtained during previous investigations. These properties were being managed by NJDEP and the report suggested that soils from these areas might have already been remediated.

Groundwater: Arsenic, chromium, and lead were present in a localized area and transport of these constituents downgradient of this area is limited by geochemical conditions at OU1. PCBs were not detected in groundwater. SVOCs were detected in groundwater at the majority of sampling locations at OU1, but results indicated that two separate areas of VOCs exist. The first area contains benzene, toluene, and xylene at OU1. The second area comprises chlorinated ethane constituents and is limited to the Lustrelon property north of the study area. SVOCs were detected in groundwater at OU1. The highest SVOC concentrations were detected in source areas associated with coal tar.

Extent of NAPL: The NAPL extent is limited vertically at OU1 by the presence of the confining unit. The NAPL varies in viscosity from solid non-mobile product to thick, oil-like product. Oil-like product has collected in monitoring wells at OU1 and is adjacent to the bulkhead. Sheens observed in the Hudson River appear to develop from both the upland source area and the sediment source area. The RSI report concluded that NAPL in the fill adjacent to the bulkhead is able to flow and exists at a higher elevation than the river sediments. The NAPL has the potential to flow to the river through the fill material that has higher permeabilities due to the abundance of debris and poor compaction.

Public Health Assessment (NJDOHSS, 2002)

The New Jersey Department of Health and Senior Services (NJDOHSS), the Agency for Toxic Substances and Disease Registry (ATSDR), NJDEP, and USEPA visited OU1 on January 19, 2001, and NJDOHSS conducted a public health assessment of OU1. For each of the potential pathways evaluated (i.e., surface soil and dust, ambient air, sediment), there is presently no *route of exposure* element to complete the human exposure pathway at OU1. According to the Assessment, this is due to the fact that OU1 is currently closed to entry, portions of OU1 are covered with asphalt, and no work activity is occurring at OU1 at the present time. During both Site visits, however, there were indications of trespassers at OU1 (e.g., footprints, evidence of individuals walking their dogs). The potential for exposure to these individuals on a routine basis is unlikely and does not justify a completed human exposure pathway designation. Based upon available information and observation at OU1, potential human exposure routes may include dermal contact with and/or incidental ingestion of contaminated on-site soils and river sediments. Although site-specific air data were not available for review by NJDOHSS for the Public Health Assessment, general concerns regarding odors at OU1 may suggest a localized potential air pathway, especially during any future remediation and/or construction activities which disturb on-site soils. Additionally, these activities may produce fugitive dust exposures for the nearby community. There are no data currently available that establish a completed exposure pathway to nearby human populations. Although data was limited, results of air and soil sample data from the Palisades Child Care Center do not indicate a health concern.

2004 Preliminary Assessment, Heagney and Frola Properties (O'Brien & Gere, 2004)

The Preliminary Assessment report addresses Block 93, Lots 1, 2, and 3, the 2.63-acre area between Old River Road and River Road. The assessment included site visits, a review of historical documents and property deeds, interviews with property owners, a review of regulatory agency documents, and an evaluation of other information obtained during the assessment process. The Preliminary Assessment summarized previous investigations and historical information, concluding that the properties three lots have been confirmed to or could contain contaminants in the fill layer above the New Jersey Residential and Non-Residential Soil Cleanup Criteria (NJSCC). In addition, a 10,000-gallon ammonia aboveground storage tank is suspected to have been located on Lot 1, and the removal of two 1,000-gallon USTs on Lot 3 could not be confirmed. No environmental samples were collected as part of the Preliminary Assessment. The property immediately upgradient of these properties (Solar Color and Chemical facility) was reported as having an open leaking UST case as a result of the release of an unknown quantity of xylene.

SECTION 2

Screening-Level Problem Formulation (Step 1)

This section describes the screening-level problem formulation and establishes the goals, scope, and focus of the SLERA. This section provides the following information:

- The environmental setting in terms of the habitats and biota known or expected to be present at OU1.
- The types and concentrations of chemicals present in ecologically relevant media.
- A preliminary conceptual model that describes potential sources, potential transport pathways, potential exposure pathways and routes, and potential receptors.
- The assessment and measurement endpoints selected to evaluate these receptors for which complete and potentially critical exposure pathways exist are described in this section.
- A summary of the fate, transport, and toxicological properties of the chemicals present.

2.1 Environmental Setting

The environmental setting of OU1 was characterized using information compiled from existing documents and observations made while completing site work. The characterization of the environmental setting is important in identifying potential receptors (habitats and biota) for the ERA, as well as in identifying potentially complete transport and exposure pathways from source areas to these receptors. The major components of the environmental setting are described in the following subsections.

2.1.1 Physiographic Features

OU1 is located in the Piedmont Physiographic province of New Jersey. This region, also called the Triassic Lowlands, is marked by low, north–south–trending hills. Elevations in this province range from near sea level at OU1 to 771 ft approximately 500 feet to the west. The Triassic lowlands are underlain by rocks of the late Triassic Newark Group, which is made up of both sedimentary and igneous rocks. The bedrock at OU1 is composed of a fluvial/alluvial deposit of arkose (feldspathic arenite), mudstone, and conglomerate known as the Stockton Formation, which is part of the Newark Group and is a narrow area of rock between the Palisades Diabase to the west and Hudson River Deposits to the east (USDA, 1994). The Stockton Formation is overlain by 30 to 60 ft of unconsolidated deposits consisting of 20 to 40 ft of estuarine and salt marsh deposits overlain by 10 to 20 ft of non-native fill.

The native estuarine and salt marsh deposits overlying bedrock at OU1 consist of 5 to 10 ft of fine to medium well-sorted sand followed by 10 to 20 ft of soft silt and clay that contains traces of roots and shell fragments. These layers are overlain by 5 to 10 ft of medium to coarse, poorly sorted sand. There is a discontinuous peat layer observed in the western portion of OU1 east of River Road. The marsh deposits pinch out to the west near River Road. The non-native fill consists of a mixture of gravel, sand, and silt with cinder/slag material, brick, wood, and concrete fragments overlying the native soils (CH2M HILL, 2005). The U.S. Department of Agriculture (USDA) classifies the soils at OU1 as Urban Lands (USDA, 1994). A wooden bulkhead separates the upland OU1 portion of the Site from the Hudson River (OU2) portion of the Site.

2.1.2 Habitat

The limited urban habitat on the Quanta Resource property is characterized as having low ecological resource value with no sensitive habitats. Approximately 30% percent of the Quanta Resource property is covered with pavement and asphalt. A road with small parking areas crosses the property from west to east. The remainder of the property consists of barren areas (approximately 20% of the property) covered with debris or old foundations and some areas covered by vegetation. The only viable habitat on the property consists of an urban old field community of plants with shrubs and small trees that covers approximately 50% of the property and is located on either side of the access road. The western end of the property is open near the property entrance but is increasingly vegetated moving east towards the river. The vegetation in this area is characterized by pioneer weed species typical of disturbed areas including common ragweed (*Ambrosia artemisfolia*), burdock (*Arctium minus*), bull thistle (*Cirsium vulgare*), daisy fleabane (*Erigeron annuus*), smartweed (*Polygonum sp.*), and goldenrod species (*Solidago sp.*). Several thick stands of common reed (*Phragmites australis*) are clustered in wet areas on OU1. A larger patch of common reed is located along the southern side of the property. Several small trees and shrubs are growing in patches within the old field community. The most common tree on the property is quaking aspen (*Populus tremuloides*). Larger trees are located on the borders of the property. The eastern side of the property is more heavily vegetated, however because of its small size and industrialized/disturbed nature, the property generally provides poor quality habitat. Figure 2-1 presents an aerial photograph of OU1 showing the disturbed nature of this property.

There are no permanent aquatic habitats on the upland portion of OU1. Large puddles were noted on the western and northern sides of OU1 in October, 2005, following a period of heavy rain. These puddles were not present in the spring and summer of 2005.

2.1.3 Biota

The relatively small size and historically industrial nature of the Quanta Resources property has resulted in conditions that do not support a diverse or extensive ecological community. The vegetated area of the property could provide cover and food for herbivorous and soil-invertebrate-eating small mammals. However, no signs of small mammals were observed at OU1 during the summer and fall of 2005 and the soils at OU1 appeared to be of poor quality. The nature of the soils and urban fill found at OU1 do not appear to support a healthy plant and soil invertebrate community, and therefore may not support small mammals. If small mammals were present they would provide food for higher-trophic-level predators. Small mammals that could potentially use the on-Site habitat include the short-tailed shrew (*Blarina brevicauda*), meadow vole (*Microtus pennsylvanicus*), white-footed mouse (*Peromyscus leucopus*), Norway rat (*Rattus norvegicus*), and raccoon (*Procyon lotor*).

Raccoon tracks were observed on OU1. Birds observed on the property or likely to use this habitat include, American robin (*Turdus migratorius*), song sparrow (*Melospiza melodia*), mourning dove (*Zenaida macroura*), white-throated sparrow (*Zonotrichia albicollis*), house sparrow (*Passer domesticus*), red-winged blackbird (*Agelaius phoeniceus*), starling (*Sturnus vulgaris*), and possibly urban avian predators such as red-tailed hawks (*Buteo jamaicensis*). During a site visit in October 2005, Canada geese (*Branta canadensis*) were noted resting at OU1.

2.1.4 Threatened and Endangered Species

The occurrence of threatened and endangered species within a one mile radius of OU1 was evaluated by contacting the U.S. Fish and Wildlife Service (USFW), National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service, and the New Jersey DEP Natural Heritage Program. Information was requested for both terrestrial and aquatic species even though this ERA is only addressing terrestrial receptors. The response letters received from each agency are provided in Appendix A.

Information provided by the USFW indicated that other than an occasional transient bald eagle (*Haliaeetus leucocephalus*) no federally listed or proposed endangered or threatened flora or fauna are known to occur within the a one mile radius of the project site. The NJ Natural Heritage Database and the Landscape Project do not indicate the occurrence of any rare wildlife or plant species or ecological communities within a one mile radius of OU1.

The NOAA response indicated that endangered fish species may be present in the adjacent Hudson River and that the area is designated as Essential Fish Habitat (EFH). Aquatic receptors will be addressed as part of the OU2 investigation.

2.2 Summary of Available Analytical Data

Surface soil and surface water analytical data collected during the OU1 Remedial Investigation/Feasibility Study (RI/FS) were used to evaluate risk in this SLERA. While many sampling events have occurred at OU1, none of the historic data has been validated and was therefore not included in this ERA. All of the current RI data used in the SLERA was validated following the process outlined in the QAPP (CH2M HILL, 2005). The review of the analytical data was performed in accordance with USEPA National Functional Guidelines and SW846 methodology.

2.2.1 Surface Soil

Twelve surface soil samples were collected on the Quanta Resources property. These samples were spread throughout OU1 as shown in Figure 2-2. Surface soil samples were collected from depth intervals of 0.0 to 2 inches, 0.0 to 6 inches, or 0.0 to 12 inches. Soil samples were analyzed for the following: VOCs by USEPA SW846 Method 8260B, SVOCs by SW846 Method 8270C, Pesticides by SW846 Method 8081B, PCBs by SW846 Method 8082, metals by SW846 Method 6010B, and hexavalent chromium by SW846 Method 7196A.

All soil samples collected from three depth ranges noted above were included as surface soil samples. Table 2-1 presents the summary statistics for the surface soil data set. All twelve samples were analyzed for metals. Arsenic, chromium, and lead were detected in all of the samples, with lead detected at the highest concentration (408 mg/kg). Hexavalent chromium was detected in two samples with a maximum concentration of 3.5 mg/kg.

Pesticides were analyzed in three of the 12 samples and detected in one sample. Including a duplicate sample a total of four samples were analyzed for pesticides. The pesticide 4,4-DDT and the breakdown product 4,4-DDD were detected in one sample at concentrations of 0.035 mg/kg and 0.029 mg/kg, respectively.

PCB Aroclor compounds were analyzed in all of the surface soil samples. Aroclor 1260 was detected in 8 of the samples with a maximum detected concentration of 1.10 mg/kg. Aroclors 1254 and 1242 were also detected in 3 of the samples. Maximum concentrations for Aroclor 1254 and 1242 were 0.50 mg/kg and 0.59 mg/kg, respectively.

VOC and SVOC analysis were completed on all of the surface soil samples. Thirteen VOCs were detected at varying frequency in the soil samples. Most of the detected VOCs were BTEX compounds with total xylenes detected at the highest concentration (21.0 mg/kg). Benzene was detected in nine samples with a maximum value of 2.1 mg/kg.

Twenty nine SVOCs were detected in the surface soil samples with nineteen of the SVOCs detected in every sample. As would be expected at a creosote site, the majority of the compounds detected were heavy and light molecular weight PAHs. Napthalene was detected at the highest concentration in the surface soils (concentration up to 1,800 mg/kg). Several other PAHs, including phenanthrene, pyrene, fluoranthene, chrysene, benzo(a)anthracene, and acenapthene were detected at high concentrations ranging from 200 mg/kg to 800 mg/kg. Benzo(a)pyrene was detected in all of the samples with a maximum value of 530 mg/kg.

2.2.2 Surface Water

In order to evaluate exposure from drinking water to upper-trophic level receptors in the SLERA, four samples were collected from puddles on the Quanta Resource property. Surface water samples were analyzed for the following: VOCs by SW846 Method 8260B, SVOCs by SW846 Method 8270C, Pesticides by SW846 Method 8081B, PCBs by SW846 Method 8082, metals by SW846 Method 6020, and ammonia by USEPA Method 350.2.

Table 2-2 presents the summary statistics for the surface water data set. Five pesticides were detected at low concentration (< 0.5 µg/L) in the water samples. No PCB compounds were detected in the water samples. PAHs were detected in 3 of the 4 samples, with fluoranthene detected at the highest concentration (110 µg/L).

2.3 Contaminant Fate and Transport

The media of concern for ecological receptors at OU1, is primarily soil as no permanent aquatic habitats are present in OU 1. This section will discuss contaminant fate and transport mechanisms for the main contaminant groups detected in surface soil at OU1.

The Quanta Resources property was operated as a tar processing facility manufacturing creosote, coal tar pitches, and refined tars for 44 years. In 1974 site operations changed and the site was used for the storage and recycling of waste oils. Coal tar (creosote) is composed of up to 300 compounds which is comprised of the following five chemical classes (Bol, 1998):

- 90% aromatic hydrocarbons including PAHs, alkylated PAHs, toluene, benzene, and total xylenes,
- 5-7.5% oxygen-containing heterocycles including dibenzofurans,
- 1-3% phenolics including phenols, cresols, xylenols, and naphthols,
- 1-3% nitrogen-containing heterocycles including pyridines, quinodines, acridines, indolines, and carbazoles, and
- 1-3% sulfur-containing heterocycles including benzothiophenes.

As would be expected, based on the past site history, the main classes of contaminants detected in OU 1 media are metals, PCBs, PAHs, and VOCs. The fate and transport properties of these compounds are discussed below.

2.3.1 Metals

Arsenic, chromium, and lead were detected in soils at OU1. A variety of factors affect the fate of inorganics in soil, including: soil moisture, presence of complexing agents, pH and redox potential, temperature, and organic content of soil. Soil sorption constants for metals vary significantly with environmental conditions. In general, the metals detected on site (arsenic, chromium, and lead) will adsorb to soil or organic matter. Metals sorbed to soil particles are likely to be relatively immobile is soil, but they could be transported by erosion during rain and storm events. Depending on environmental conditions, some metals can be leached from soils at which point they become mobilized and migrate to groundwater or surface water.

Several metals are bioaccumulated by plants and other organisms. Bioavailability is dependent on environmental conditions in soil. Metals such as chromium and lead have a tendency to bioaccumulate to a greater degree than other metals (HSDB, 2002).

2.3.2 PCBs

PCBs are a group of manufactured organic chemicals that were banned in the United States in 1977 because of their proven adverse environmental effects. PCBs occur in a variety of different formulations consisting of mixtures of individual compounds such as Aroclor 1016, 1248, 1254, and Aroclor 1260. The Aroclor formulations vary in the percent chlorine, and generally, the higher the chlorine content the greater the toxicity. Two mechanisms allow PCB concentrations to change in the environment: degradation and weathering. Under normal environmental conditions, PCBs are slow to degrade. Microbial degradation depends on the position of the chlorine atom on the biphenyl molecule and the degree of chlorination. Higher chlorinated compounds (those with five or more chlorine atoms) are more persistent in the environment and are not readily transformed by bacteria. The number and position of the chlorine atoms on the biphenyl rings also influence how biological organisms incorporate and are affected by exposure to PCBs. PCBs are highly soluble in lipids and are known to biomagnify in upper trophic levels. Congeners with higher chlorine contents (and higher log K_{ow} values) tend to bioaccumulate the most and, depending on structure, metabolize the least. The toxicity is influenced by the presence or absence of chlorines bound to the phenyl ring. Since congeners tend to bioaccumulate and biomagnify, evaluations of potential adverse effects to ecological receptors are generally focused on upper-trophic level organisms.

2.3.3 PAHs

PAH compounds are the main chemical compounds in coal tar and creosote and are thus found in soil throughout OU1. The chemical and physical properties of coal tar and creosote vary due to the distillation process and the initial tar variants used. Coal tar and creosote are derived from a mixture of heavy residual oils and is most commonly made from the distillation of coal tar, but can be made from a variety of tars including wood-based, petroleum, and coal-based tars.

The size range of the PAH molecules that make up creosote affects their mobility and persistence in the environment. Lower molecular weight PAHs are more soluble and susceptible to degradation processes than higher weight PAHs (Bol, 1998), but the PAHs that make up creosote are typically immobile in the environment. PAHs are lipophilic, have low water solubilities, and a high affinity to adsorb to soil and geologic media. Migration of PAHs in the environment can occur, but it is primarily by transport of PAH molecules absorbed to soil, dust, or sediment particles. PAHs are also resistant to photolytic, oxidative, and hydrolytic degradation, which further increases their persistence in the environment. PAHs can be broken down by microbial degradation, but the rate and degree of biodegradation depends on the number of aromatic rings and the number of alkyl groups which affect the PAH molecule's solubility and thus bioavailability (Baker and Henson, 1994).

PAHs are metabolized and thus do not readily bioaccumulate in most terrestrial organisms. The rate that PAHs are metabolized is dependent on the molecular weight or size of the molecule. Higher molecular weight PAHs take longer to metabolize and thus some bioaccumulation in organisms can occur. In fate studies, alkylated PAHs were found to bioaccumulate to a greater degree than non-alkylated PAHs. Plants have been shown to concentrate PAHs in certain areas, primarily in the roots (Thornburn, 1998). Even though some organisms may bioaccumulate PAHs, it is unlikely that PAHs will biomagnify through multiple levels of a food chain (Brandt, 2002).

2.3.4 VOCs

BTEX were the primary VOCs detected at OU1. These compounds are constituents of both creosote and oil. Aromatic petroleum hydrocarbons such as BTEX volatilize quickly and are fairly mobile in soils (Howard, 1991). Biodegradation of BTEX compounds occurs in soils, but often slowly when concentrations are high and possibly toxic to microorganisms. Biodegradation occurs more rapidly under aerobic conditions. Because BTEX compounds are fairly mobile and tend to volatilize or migrate to groundwater, they do not typically accumulate in soils. At OU1, volatiles were detected in the surface soil samples as a result of contaminant source areas present at OU1.

2.4 Ecotoxicity

Ecotoxicological information for the contaminants detected at the highest concentrations and is provided in the following sections.

2.4.1 Metals

Arsenic

Arsenic can be absorbed through ingestion, inhalation, or dermal contact. Trivalent compounds of arsenic are the most toxic form. The primary toxic action of arsenic is caused by its effect on mitochondrial enzymes and tissue respiration. Arsenic inhibits energy functions in mitochondria (Goyer, 1993). Chronic toxicity caused by arsenic exposure includes neurotoxicity of the central and peripheral nervous system, liver damage (cirrhosis), and vascular disease (Goyer, 1993). Arsenic is a known carcinogen causing skin and lung cancer in humans (Goyer, 1993) but there is insufficient data linking it to cancer in animals (HSDB, 2003).

Chromium

Chromium occurs in the environment in two major valence states, trivalent chromium (III) and hexavalent chromium (VI). Chromium (III) is essential to normal glucose, protein, and fat metabolism and is thus an essential dietary element. The body has several systems for reducing chromium (VI) to chromium (III). This chromium (VI) detoxification leads to increased levels of chromium (III) (ATSDR, 2000). Chromium (VI) is far more toxic than chromium (III), for both acute (short-term) and chronic (long-term) exposures. Chronic exposure to high levels of chromium (VI) by inhalation or oral exposure may produce effects on the liver, kidney, gastrointestinal and immune systems, and possibly the blood. Animal studies have not reported reproductive effects from inhalation exposure to chromium (VI). Oral studies have reported severe developmental effects in mice such as gross abnormalities and reproductive effects including decreased litter size, reduced sperm count, and degeneration of the outer cellular layer of the seminiferous tubules (ATSDR, 2000).

Lead

Lead is the most common toxic metal and is detectable in all phases of the environment and biological systems. Toxicity to mammals is known to include increased mortality, reproductive effects, reduced growth, alterations of blood chemistry, and behavioral changes. Lead affects the nervous system, the blood system, gastrointestinal system, and reproductive system. It is known to be a powerful neurotoxin and acts by depressing neurotransmission through inhibition of cholinergic function, impairment of dopamine uptake, and the disruption of other neurotransmitters. Lead causes anemia by impairment of blood cell production and shortening of the life span for a blood cell (Goyer, 1993). Lead is a confirmed animal carcinogen causing tumors in multiple sites.

2.4.2 PCBs

The PCB Aroclor formulations vary in the percentage of chlorine and generally, the higher the chlorine content, the greater the toxicity. PCBs elicit a variety of biologic and toxic effects including death, birth defects, reproductive failure, liver damage, tumors, and a wasting syndrome (Eisler, 1986). These are known to bioaccumulate and to biomagnify within the food chain. Toxicity data for white-footed mice, oldfield mice, and mink show that reproductive systems and developing embryos for these organisms were adversely affected by both acute and chronic exposures (McCoy et al., 1995).

2.4.3 PAHs

PAHs are often considered as a group of similar acting chemicals and toxicity is often based on the mode of action of well known PAHs such as benzo(a)pyrene or the sum of all PAHs detected at a site. In reality, PAHs exhibit size and structural difference that effect their fate and toxicity (Sverdrup, 2001).

PAHs are toxic to receptors at low to moderate concentrations in environmental media and food (Brandt, 2002). The toxic mode of action of PAHs has been classified as nonspecific or narcotic. Narcotic chemicals act by dissolving into biological membranes and disrupting the membrane function and fluidity. These compounds do not bind to specific molecules (Sverdrup, 2002).

In general, the smaller PAHs are considered to be more acutely toxic, and the larger high molecular weight PAHs have carcinogenic, teratogenic, and mutagenic effects (Eisler, 1987 Carcinogenicity of the larger PAHs is related to the metabolism of these compounds. For all large PAHs, many animals can biotransform the compounds in the liver through the cytochrome P-450 enzyme system and the detoxified metabolites are excreted. However, it is confirmed that some of the metabolites formed during detoxification are carcinogens (Williams, 1993).

Studies of laboratory animals exposed to PAHs have indicated that tumors form in the kidneys, liver, and intestines. Rodents are very susceptible to skin cancer from exposure to PAHs (Williams, 1993)

2.5 Preliminary Ecological Conceptual Model

The conceptual model was designed to diagrammatically relate potentially exposed receptor populations with potential contaminant source areas based on the physical nature of OU1 and potential exposure pathways. Important components of a preliminary conceptual model are the identification of potential sources of contaminants, transport pathways, exposure media, potential exposure routes, and potential receptor groups. A complete exposure pathway has three components: (1) a source of chemicals that can be released to the environment; (2) a pathway of contaminant transport through an environmental medium; and (3) an exposure or contact point for an ecological receptor.

2.5.1 Source Areas, Exposure Pathways and Routes, and Exposure Media

Figure 2-3 summarizes the pathways by which chemicals could be transported at OU1. As depicted in Figure 2-3, chemicals historically have been released to surface soil via direct releases from a surface spill, a surface leak, or surface disposal. Possible release pathways include infiltration into the soil and groundwater by the lighter and more mobile fractions of the creosote, oil, and tar products. These lighter coal tar fractions will move offsite with groundwater. Heavy PAH and oil compounds will absorb to soil particles as will metals and PCBs. Once bound to soil particles, these compounds can be transported by surface water runoff during storm events or by wind during dry conditions. During heavy flow soil particles on site may be transported offsite as surface water drains to the river. The volatile components of the creosotes and tar pitches such as naphthalene will volatilize.

Complete exposure pathways currently exist for terrestrial ecological receptors. Terrestrial animals may be exposed to chemicals in soil via direct contact with the soil, incidental ingestion of soil, and ingestion of contaminated food items. Terrestrial vegetation may be exposed to chemicals via direct contact of roots to soils. Exposure to chemicals present in the surface soil via dermal contact may occur but is unlikely to represent a major exposure pathway for upper trophic level receptors because fur or feathers minimize transfer of chemicals across dermal tissue. Direct contact is a potential exposure route for soil invertebrates. Exposure to chemicals through drinking water ingestion was considered in this ERA and samples, collected from the shallow puddles and low lying areas on OU1 were collected to quantify this potential exposure pathway. Surface water from the Hudson River was not considered as a potential source of drinking water for terrestrial receptors due to the waters high salinity which ranges from 18.0 to 30.0 parts per thousand (ppt) in this part of the river.

The relative importance of these exposure routes depends in part on the chemical being evaluated. For chemicals having the potential to bioaccumulate, such as PCBs, the greatest exposure to wildlife is likely to be from the ingestion of prey. For chemicals having a limited potential to bioaccumulate, the exposure of wildlife to chemicals is likely to be greatest through the direct ingestion of the contaminated soil.

Although some volatile chemicals may be present in soil, inhalation will not typically represent a significant exposure pathway because the concentrations of volatiles in surface soil are generally not very high and potential breathing zone exposures are expected to be low for most receptors. In addition, the chemical contribution from the inhalation pathway is generally insignificant for upper trophic level ecological receptors relative to the ingestion pathways. Hence, the air pathway is not considered for ecological receptors in this SLERA.

2.5.2 Receptor Species

Assessment and Measurement Endpoints

The conclusion of the problem formulation includes the selection of ecological endpoints, which are based upon the conceptual model. There are two types of endpoints in the ERA process: assessment endpoints and measurement endpoints (USEPA 1992, 1997a, 1998). An assessment endpoint is an explicit expression of the environmental component or value that is to be protected. A measurement endpoint is a measurable ecological characteristic that is related to the component or value chosen as the assessment endpoint. The considerations for selecting assessment and measurement endpoints are summarized in USEPA (1992, 1997a) and discussed in detail in Suter (1989, 1990, 1993).

Endpoints in the ERA define ecological attributes that are to be protected (assessment endpoints) and a measurable characteristic of those attributes (measurement endpoints) that can be used to gauge the degree of impact that has or might occur. Assessment endpoints most often relate to attributes of biological populations or communities, and are intended to focus the risk assessment on particular components of the ecosystem that could be adversely affected by chemicals attributable to OU1 (USEPA, 1997a). Assessment endpoints contain an entity (e.g., shrew population) and an attribute of that entity (e.g., survival rate). Individual assessment endpoints usually encompass a group of species or populations (the receptor) with some common characteristic, such as specific exposure route or contaminant sensitivity, with the receptor then used to represent the assessment endpoint in the risk evaluation.

Assessment and measurement endpoints might involve ecological components from any level of biological organization, from individual organisms to the ecosystem itself (USEPA, 1992). In most cases the ERA will evaluate effect to individual organisms as an indicator of effects to an entire population. Effects on individuals are important for some receptors, such as threatened and/or endangered species; but population- and community-level effects are typically more relevant to ecosystems. Threatened and endangered species were not identified for OU1. Population- and community-level effects are usually difficult to evaluate directly without long-term and extensive study. However, measurement endpoint evaluations at the individual level, such as an evaluation of the effects of chemical exposure on reproduction, can be used to predict effects on an assessment endpoint at the population or community level. In addition, use of criteria values designed to protect the majority (e.g., 95 percent) of the components of a community can be useful in evaluating potential community- and/or population-level effects for non-endangered taxa.

Because of the complexity of natural systems, it is generally not possible to directly assess the potential impacts to all ecological receptors present within an area. Therefore, specific receptor species (e.g., short-tailed shrew) or species groups (e.g., invertebrates) are often selected as surrogates to evaluate potential risks to larger components of the ecological community (guilds, such as carnivorous birds) used to represent the assessment endpoints (e.g., survival and reproduction of carnivorous birds). Selection criteria typically include those species that:

- Are known to occur, or are likely to occur, at OU1;
- Have a particular ecological, economic, or aesthetic value;
- Are representative of taxonomic groups, life history traits, and/or trophic levels in the habitats present at OU1 for which complete exposure pathways are likely to exist; and/or
- Can, because of toxicological sensitivity or potential exposure magnitude, be expected to represent potentially sensitive populations at OU1.

The following upper trophic level receptor species were chosen for exposure modeling based on the identification of potential exposure pathways, likelihood of occurrence on OU1, the general guidelines presented in USEPA (1991), comments received from USEPA Region II BTAG, and the assessment endpoints discussed in the following subsection:

- Short-tailed shrew (*Blarina brevicauda*) - terrestrial mammalian insectivore
- White-footed mouse (*Peromyscus leucopus*) - terrestrial mammalian omnivore
- Long-tailed weasel (*Mustela frenata*) - terrestrial mammalian carnivore
- Raccoon (*Procyon lotor*) - semi-aquatic mammalian omnivore
- Meadow vole (*Microtus pennsylvanicus*) - mammalian herbivore
- American robin (*Turdus migratorius*) - terrestrial avian insectivore/omnivore

- Red-tailed hawk (*Buteo jamaicensis*) - terrestrial avian carnivore

Lower trophic level receptor species were evaluated based upon those taxonomic groupings for which medium-specific screening values have been developed; these groupings and screening values are used in most ecological risk assessments. As such, specific species of terrestrial plants and soil invertebrates (earthworms are the standard surrogate) were evaluated using soil screening values developed specifically for these groups.

Upper trophic level receptor species quantitatively evaluated in the ERA were limited to birds and mammals (as shown in the preceding list), the taxonomic groups with the most available information regarding exposure and toxicological effects. Individual species of reptiles were not selected for evaluation because of the urban habitat and general lack of available toxicological information for these taxonomic groups from food web exposures. Table 2-3 summarizes the assessment and measurement endpoints selected for the ERA.

SECTION 3

Screening-Level Effects Assessment (Step 2)

3.1 Media-Specific Soil Screening Values

Media-specific soil screening values (expressed as concentrations within a media) used in this ERA are designed to be protective of plant and invertebrate communities from direct exposure to chemicals in surface soil. Soil screening values were based on USEPA Soil Screening Levels (USEPA 2005a, 2005b), Preliminary Remediation Goals for Ecological Endpoints (Efroymson et al., 1997), and alternate screening values from the scientific literature. Values taken from the scientific literature were selected based on protection of the ecological receptor populations being evaluated. The Oak Ridge National Laboratory (ORNL) soil values, for example, are designed to be protective of 90% of soil-associated organisms. A list of the soil screening values used in this SLERA is provided as Table 3-1.

3.2 Ingestion Screening Values

Ingestion screening values were derived for each upper trophic level receptor species. Toxicological information from the literature for wildlife species most closely related to the receptor species was used, where available, but was also supplemented by laboratory studies of non-wildlife species (e.g., laboratory mice) where necessary. The ingestion screening values were expressed as milligrams of the chemical per kilogram body weight of the receptor per day (mg/kg-BW/day).

Growth and reproduction were emphasized as toxicological endpoints since they are the most relevant, ecologically, to maintaining viable populations and because they are generally the most studied chronic toxicological endpoints for ecological receptors. If several chronic toxicity studies were available from the literature, the most appropriate study was selected for each receptor species based on consideration of study design, study methodology, study duration, study endpoint, and test species.

No Observed Adverse Effect Levels (NOAELs) based on growth and reproduction were utilized, where available, as the screening values. When chronic NOAEL values were unavailable, estimates were derived or extrapolated from chronic Lowest Observed Adverse Effect Levels (LOAELs) using an uncertainty factor or 10 (USEPA 1997a). In addition, when values for chronic toxicity were not available, a subchronic value was converted to a chronic value using an uncertainty factor of 10 (USEPA 1997a). Toxicity studies longer than 90 days or during a critical life stage were considered of chronic duration (USEPA 1997a). Ingestion-based screening values for mammals and birds are summarized in Tables 3-2 and 3-3, respectively.

SECTION 4

Screening-Level Exposure Assessment (Step 2)

4.1 Screening Exposure Point Concentrations

Maximum media concentrations were used as exposure point concentrations for direct exposure estimation and food web modeling in the screening portion of the ERA based on the following guidelines:

- For each data group, the maximum detected chemical concentrations in soil were used to conservatively estimate potential direct chemical exposures.
- For chemicals not detected, the maximum method reporting limit was used as the maximum detected chemical concentration to estimate the potential direct exposure.
- For samples with duplicate analyses, the higher of the two detected concentrations was used if both values are detects. In cases where one result was a detection and the other a non-detect, the detected value was used in screening.

Exposure point concentrations (concentrations in plants, soil invertebrates, and small mammal prey items) for terrestrial predators were estimated using bioaccumulation models and maximum measured media concentrations. The methodology and models used to derive these estimates are described below.

4.1.1 Terrestrial Plants

Tissue concentrations in the aboveground vegetative portion of terrestrial plants were estimated by multiplying the maximum surface soil concentration for each constituent by constituent-specific soil-to-plant BCFs obtained from the Bechtel Jacobs (1998) and USEPA (2005c). For organic constituents without chemical specific BCFs identified in USEPA (2005c), BCFs were estimated from the log K_{ow} using the equation provided in USEPA (2005c). The log K_{ow} values used in these calculations were obtained from Jones et al. (1997), Sample et. al (1996), and USEPA (1995a, 1996) and are listed in Table 4-1. The BCF values used were based on root uptake from soil and on the ratio between dry-weight soil and dry-weight plant tissue. Literature values based on the ratio between dry-weight soil and wet-weight plant tissue were converted to a dry-weight basis by dividing the wet-weight BCF by the estimated solids content for plants (15 percent [0.15]; Sample et al., 1997). The soil-to-plant BCFs used in the screening portion of the ERA are shown in Table 4-1.

4.1.2 Earthworms

Tissue concentrations in soil invertebrates (earthworms) were estimated by multiplying the maximum surface soil concentration for each constituent by constituent-specific bioconcentration factors (BCFs) or bioaccumulation factors (BAFs obtained from the literature. BCFs are calculated by dividing the concentration of a constituent in the tissues of an organism by the concentration of that same constituent in the surrounding environmental medium (in this case, soil) without accounting for uptake via the diet. BAFs consider both direct exposure to soil and exposure via the diet. Because earthworms consume soil, BAFs are more appropriate values and are used in the food web models when available. BAFs based on depurated analyses (soil was purged from the gut of the earthworm prior to analysis) are given preference over undepurated analyses when selecting BAF values because direct ingestion of soil is accounted for separately in the food web model.

The BCF/BAF values used were based on the ratio between dry-weight soil and dry-weight earthworm tissue. Literature values based on the ratio between dry-weight soil and wet-weight earthworm tissue were converted to a dry-weight basis by dividing the wet-weight BCF/BAF by the estimated solids content for earthworms (16 percent [0.16]; USEPA, 1993). For constituents without available measured BAFs or BCFs, an earthworm BAF of 1.0 was assumed. The soil-to-earthworm BCFs/BAFs used in the screening portion of the ERA are shown in Table 4-1.

4.1.3 Small Mammals

Whole-body tissue concentrations in small mammals (mice, shrews, and voles) were estimated using one of two methodologies. For constituents with literature-based soil-to-small mammal BAFs, the small mammal tissue concentration was calculated by multiplying the maximum surface soil concentration for each constituent by a constituent-specific soil-to-small mammal BAF obtained from the literature. The BAF values used were based on the ratio between dry-weight soil and whole-body dry-weight tissue. Literature values based on the ratio between dry-weight soil and wet-weight tissue were converted to a dry-weight basis by dividing the wet-weight BAF by the estimated solids content for small mammals (32 percent [0.32]; USEPA, 1993). BAFs for shrews are those reported in Sample et al. (1998b) for insectivores (or for general small mammals if insectivore values were unavailable) and for voles are those reported for herbivores. The soil-to-small mammal BAFs are shown in Table 4-1.

For constituents without soil-to-small mammal BAF values, an alternate approach was used to estimate whole-body tissue concentrations. Because most constituent exposures for these small mammals is via the diet, it was assumed that the concentration of each constituent in the small mammal's tissues is equal to the constituent concentration in its diet, that is, a diet to whole-body BAF (wet-weight basis) of one was assumed. The use of a diet to whole-body BAF of one is likely to result in a conservative estimate of constituent concentrations for constituents that are not known to biomagnify in terrestrial food webs (e.g., PAHs) based on reported literature values for constituents that are known to biomagnify in food webs. For example, a maximum BAF (wet weight) value of 1.0 was reported by Simmons and McKee (1992) for PCBs based on laboratory studies with white-footed mice. Menzie et al. (1992) reported BAF values (wet-weight) for DDT of 0.3 for voles and 0.2 for short-tailed shrews. Reported BAF (wet-weight) values for dioxin were only slightly above one (1.4) for the deer mouse (USEPA, 1990). Resulting tissue concentrations (wet-weight) were converted to a dry-weight basis using an estimated solids content of 32 percent (see above).

4.2 Dietary Intakes

Dietary intakes for each receptor species were calculated using the following formula (modified from USEPA 1993):

$$DI_x = \frac{[[\sum_i (FIR)(FC_{xi})(PDF_i)] + [(FIR)(SC_x)(PDS)] + [(WIR)(WC_x)]]}{BW}$$

where:

where:	DI_x	=	Dietary intake for chemical x (mg chemical/kg body weight/day)
	FIR	=	Food ingestion rate (kg/day, dry weight)
	FC_{xi}	=	Concentration of chemical x in food item i (mg/kg, dry weight)
	PDF_i	=	Proportion of diet composed of food item i (dry weight basis)
	SC_x	=	Concentration of chemical x in soil (mg/kg, dry weight)
	PDS	=	Proportion of diet composed of soil (dry weight basis)
	WIR	=	Water ingestion rate (L/day)
	WC_x	=	Concentration of chemical x in water (mg/L)
	BW	=	Body weight (kg, wet weight)

Receptor-specific values used as inputs to this equation for the screening portion of the ERA are provided in Table 4-2. Consistent with the conservative approach used for a SLERA, the minimum body weight and maximum food ingestion rate from the scientific literature were used for each receptor. It was assumed that constituents were 100 percent bioavailable to the receptor and it was also assumed that each receptor spent 100 percent of its time on OU1 (i.e., an area use factor [AUF] of 1.0 was assumed).

SECTION 5

Screening-Level Risk Calculation (Step 2)

The screening-level risk calculation is the final step in a SLERA. In this step, the maximum exposure concentrations in soil or exposure doses (upper trophic level receptor species) are compared with the corresponding screening values to derive screening risk estimates. The outcome of this step is a list of Constituents of Potential Concern (COPCs) for each medium-pathway-receptor combination evaluated or a conclusion of acceptable risk.

COPCs are selected using the Hazard Quotient (HQ) method. HQs are calculated by dividing the constituent concentration in the medium being evaluated by the corresponding medium-specific screening value or by dividing the exposure dose by the corresponding ingestion screening value. In accordance with the guidance followed for this SLERA, constituents with HQs greater than or equal to 1.0 are considered COPCs. If no suitable screening value was available for a chemical, the chemical was conservatively retained as a COPC and qualitatively assessed in the Uncertainties Section (Section 7.0).

HQs equaling or exceeding one indicate the potential for risk because the constituent concentration or dose (exposure) equals or exceeds the screening value (effect). However, screening values and exposure estimates are derived using intentionally conservative assumptions in the SLERA such that HQs greater than or equal to 1.0 do not necessarily indicate that risks are present or impacts are occurring. Rather, it identifies constituent-pathway-receptor combinations requiring further evaluation. HQs that are less than 1.0 indicate that risks are very unlikely, enabling a conclusion of no unacceptable risk to be reached with high confidence.

Two sets of risk calculations were performed, direct exposure (lower trophic level receptors) and food web exposure (upper trophic level receptors).

5.1 Direct Exposure

Screening statistics (including calculated HQs) of the direct exposure COPCs are presented in Table 5-1.

5.1.1 Inorganics

HQs are $\geq$ 1.0 for arsenic, chromium, and lead, and these exceedances are based on comparison of detected concentrations to screening values. Hexavalent chromium was also detected, but a screening value was not available and an HQ was not calculated.

5.1.2 Pesticides/PCBs

HQs are $\geq$ 1.0 for four pesticides (aldrin, alpha-BHC, dieldrin, and endrin) and four PCBs (Arcoclor-1016, Arcoclor-1221, Arcoclor 1232, and Arcoclor 1248). All exceedances are based on a comparison of reporting limits (i.e., non-detects) to screening values. Screening values were not available for 14 pesticides and HQs were not calculated for these chemicals.

5.1.3 SVOCs

HQs are ≥ 1.0 for 29 SVOCs. HQs range from 1.83 for 1,1′-biphenyl to 18,000 for naphthalene. Eleven of the exceedances are based on comparison of reporting limits (i.e., non-detects) to screening values. Thirty SVOCs did not have screening values, nine of which were detected in surface soil, and HQs were not calculated for these chemicals.

5.1.4 VOCs

HQs are ≥ 1.0 for 10 VOCs. HQs range from 1.18 for ethylbenzene to 440 for vinyl chloride. Six of the exceedances, including the vinyl chloride exceedance, are based on comparison of reporting limits (i.e., non-detects) to screening values. Thirty SVOCs did not have screening values, eight of which were detected, and HQs were not calculated for these chemicals.

5.2 Food Web Exposure

Hazard quotients for each upper trophic level receptor species are summarized in Table 5-2.

5.2.1 Inorganics

NOAEL-based HQs are ≥ 1.0 for arsenic (short-tailed shrew, white-footed mouse, meadow vole, the American robin) and lead (short-tailed shrew, white-footed mouse, meadow vole, raccoon, red-tailed hawk, and the American robin). HQs range from 1.18 for raccoon exposure to lead to 34.9 for vole exposure to arsenic. All exposure doses are based on detected concentrations.

5.2.2 Pesticides/PCBs

NOAEL-based HQs are ≥ 1.0 for five pesticides (4,4′-DDE, aldrin, dielrdin, endrin, heptachlor, heptachlor epoxide, and toxaphene) and six PCBs (Arcoclor-1016, Arcoclor-1221, Arcoclor-1232, Arcoclor-1242, Arcoclor-1248, Arcoclor-1254, and Arcoclor-1260) for one or more receptors. HQs range from 1.16 for robin exposure toAroclor-1242 to 1,022 for shrew exposure to Aroclor-1248. Only exposure doses of Aroclor-1242, Aroclor-1254, and Aroclor-1260 are based on detected concentrations.

5.2.3 SVOCs

NOAEL-based HQs are ≥ 1.0 for 14 individual SVOCs, 12 of which were individual PAHs, and total PAHs. HQs range from 1.14 for weasel exposure to pentachlorophenol to 365 for shrew exposure to total PAHs. Only exposure doses for PAHs are based on detected concentrations. Screening values were not available for 4-bromophenyl-phenylether, 4-chlorophenyl-phenylether, hexachlorocyclopentadiene (birds only), and hexachloroethane (birds only), and HQs were not calculated.

5.2.4 VOCs

The HQ for 1,1,2,2-tetrachloroethane, the only VOC identified as potentially bioaccumulative by USEPA (2000), was less than 1.0 for mammals. Screening values were not available for 1,1,2,2-tetrachloroethane for avian receptors, but this chemical was not detected in any sample.

5.3 Scientific Management Decision Point

Upon completion of the SLERA, a number of COPCs were identified in surface soils. This point in the ERA process represents a Scientific Management Decision Point (SMDP) which determines whether the ERA provides enough information to indicate that no unacceptable ecological risks exist, whether the information is inadequate to make a decision on risk, or whether the potential for risk is indicated but additional data is required and the ERA will proceed to a more detailed study. The SLERA results indicate risk but because the risk estimate presented in the SLERA is based on conservative assumptions and has a high degree of uncertainty, these results should not be used for decision-making purposes. To put the identified risk in context the ecological risk assessment process proceeded to the first step of a BERA (Step 3), which involves refining the assumptions and methods used in the SLERA to be more realistic of actual ecological receptor exposure and potential effects conditions. Using realistic parameters and assumptions provides additional perspective on the conservative potential risk identified in the SLERA.

SECTION 6

Baseline Problem Formulation (Step 3)

The SLERA resulted in a set of COPCs for surface soil. This set of COPCs includes constituents with HQs greater than or equal to 1.0 (based upon maximum exposures) and detected constituents for which screening values were not available.

6.1 Refinement of Conservative Screening Assumptions

According to Superfund guidance (USEPA, 1997a), Step 3 initiates the problem formulation phase of the BERA. In the initial step of the BERA, the COPCs from the SLERA are reexamined based upon more realistic exposure assumptions to determine the range of potential risks and to determine whether any of the COPCs should be eliminated from further consideration. In this initial refinement of the COPCs, the conservative assumptions employed in the SLERA are refined and risk estimates are recalculated using the same conceptual model for OU1.

The assumptions, parameter values, and methods that were modified for the Step 3 refinement included:

- Risk estimates based on maximum constituent concentrations were supplemented by risk estimates based on average (arithmetic mean) constituent concentrations.
- BAFs and BCFs were based upon, or modeled from, central tendency estimates (e.g., median or mean) from the literature as opposed to the maximum or "high-end" (e.g., 90th percentile) estimates used in the SLERA for many constituents. Revised BAF/BCF values used in the Step 3 refinement are provided in Table 6-1.

  In the BERA, using central tendency estimates (rather than high end or maximums) for exposure parameters such as BAFs provides a more representative estimate of potential exposures and risks to receptor populations (the focus of the assessment endpoints) of upper trophic level receptors. Because these upper trophic level species are highly mobile, they would be expected to effectively average their exposure over time as they forage within the area defining their home range (which will extend to uncontaminated off-site areas). Average prey concentrations are most appropriately estimated using central tendency estimates of media concentrations and accumulation factors. For example, the wildlife dietary exposure models contained in the *Wildlife Exposure Factors Handbook* (USEPA, 1993) specify the calculation of an average daily dose. Increasing the representativeness of the exposure estimates relative to population-level effects is consistent with the intent of the Step 3 refinement. In cases where adequate spatial sampling coverage exists, mean concentrations are also appropriate for evaluating potential risks to populations of lower trophic level receptors because the members of the population are expected to be found throughout a site (where suitable habitat is present), rather than concentrated in one particular area.

- Central tendency estimates (e.g., mean, median, or midpoint) for body weight and ingestion rate (Table 6-2) were used to develop exposure estimates for upper trophic level receptors, rather than the minimum body weights and maximum ingestion rates used in the SLERA. Central tendency estimates for these exposure parameters are more relevant for a BERA because they better represent the characteristics of a greater proportion of the individuals in the population. Populations (rather than individual organisms) were the focus of the assessment endpoints for the ERA.
- In the SLERA, chemicals in the food web models were identified as COPCs if the estimated dose to wildlife exceeded the NOAEL for a chemical. The dose that is protective to wildlife, however, is expected to fall between the NOAEL and the LOAEL. Both the NOAEL and LOAEL were used for comparison in COPC Refinement. However, chemicals were eliminated as COPCs if estimated wildlife exposure doses did not exceed the LOAEL because this dose is expected to be protective of the overall population, which is the assessment endpoint being evaluated.

Only COPCs with screening values and receptors identified in the SLERA as requiring further evaluation were quantitatively addressed in the Step 3 refinement. Chemicals without screening values are discussed in the Uncertainties Section (Section 7.0).

Although some aspects of the estimation of exposure were modified in the Step 3 refinement (see above), the screening values (effects), except for the addition of LOAELs, were the same as the values used in the SLERA.

6.2 Refined Risk Characterization

6.2.1 Direct Exposure

The refined screening statistics for the direct exposure COPCs for surface soil are presented in Table 6-3. The results of these comparisons are summarized below by chemical group.

Inorganics

HQs are $\geq$ 1.0 for chromium (51.7) and lead (1.23), and both of these exceedances are based on comparison of detected concentrations to screening values. Hexavalent chromium was also detected, but a screening value was not available and an HQ was not calculated. Figure 6-1 depicts the distribution and concentration of the refined inorganic COPCs on the site property.

Pesticides/PCBs

HQs are $\geq$ 1.0 for four pesticides (aldrin, alpha-BHC, dieldrin, and endrin) and Arcoclor 1248. All exceedances are based on a comparison of reporting limits (i.e., non-detects) to screening values. HQs for these pesticides/PCBs range from 1.11 for Aroclor-1248 to 461 for endrin. As noted in Figure 6-1 pesticides were sampled at 3 locations (with an additional duplicate sample) and were not detected. PCBs were sampled at each location but were not detected.

SVOCs

HQs are $\geq$ 1.0 for 23 SVOCs. Nine of the exceedances are based on comparison of reporting limits (i.e., non-detects) to screening values. HQs for these SVOCs range from 1.12 for hexachlorocyclopentadiene to 3,080 for fluoranthene. Nine detected SVOCs did not have screening values and HQs were not calculated for these chemicals. The concentration and distribution of the refined non-PAH SVOC COPCs are provided in figure 6-2. Figure 6-3 presents PAH COPC concentrations and distribution in surface soil at the site.

VOCs

HQs are $\geq$ 1.0 for benzene, vinyl chloride, and total xylenes, and the exceedance for vinyl chloride is based on a comparison of reporting limits (i.e., non-detects) to a screening value. HQs for these VOCs range from 1.48 for total xylenes to 35.7 for vinyl chloride. Seven detected VOCs did not have screening values and HQs were not calculated for these chemicals. Figure 6-2 presents contaminant concentrations for the detected VOC COPCs.

6.2.2 Food Web Exposure

Hazard quotients for the food-web exposures based on comparison to both NOAELs and LOAELs are presented in Table 6-4. As discussed in Section 6.1, although risks are presented for both the LOAEL and NOAEL to establish a range of risks based on toxicological endpoint, the primary focus of the COPC Refinement is on the comparison to the LOAEL.

Based on comparison to LOAELs, HQs are $\geq$ 1.0 for the short-tailed shrew from exposure to Aroclor-1248, Aroclor-1260, dieldrin, pyrene, and total PAHs, and for the white-footed mouse and meadow vole from exposure to total PAHs. Exposure doses for dieldrin and Aroclor-1248 exceedances are based on reporting limits (i.e., non-detects). HQs for these chemicals range from 1.14 for the white-footed mouse and total PAHs to 7.72 for the short-tailed shrew and total PAHs.

6.3 Summary of Risk Calculations and Risk Conclusions

The refined SLERA results indicate the presence of COPCs at OU1. The following sections summarize the risk results for each of the receptors identified for evaluation in the ERA. Results of the Step 3 risk calculations are the focus of this discussion since they provide the most accurate indication of potential risks to ecological receptors.

6.3.1 Terrestrial Plants and Soil Invertebrates (Direct Exposure to Chemicals in Soil)

Using less conservative and more realistic assumptions, potential risks were identified for fewer compounds as compared to the potential risks identified using very conservative assumptions in Step 2. Potential risks were indicated to terrestrial plants and soil invertebrates from direct exposure to a variety of chemicals in surface soils including inorganics, pesticides, PCBs, SVOCS, and VOCs. Four of the pesticide/PCBs, nine SVOCs, and one VOC were not detected at the site and indicate potential risk because the reporting limits for these compounds exceed screening criteria.

When interpreting these results, however, it is important to note that this site has been greatly disturbed by historic site activities, provides low quality habitat, and is surrounded by commercial properties and the Hudson River. Approximately 30% percent of the Quanta Resources property is covered with pavement and asphalt. Although the remainder of OU1 is heavily overgrown with shrubs and small trees, the vegetation is characterized by pioneer weed species typical of disturbed areas. The eastern side of the property provides better quality habitat, however the small size and industrial nature of the surrounding area limit the diversity. The property is bordered on all other sides by commercial areas and roads, and all surrounding land surfaces are paved or covered by large buildings. The potential for colonization of this area by native species capable of supporting a high quality community is therefore unlikely. In addition, the property has a high likelihood of being redeveloped and ecological habitat is not expected to exist under future conditions.

It is therefore concluded that, although there is the potential for adverse effects to terrestrial plants and soil invertebrates, the nature of the onsite habitat is likely to limit the diversity/abundance of terrestrial plants and soil invertebrates and the overall potential for adverse effects to these receptor communities.

6.3.2 Wildlife (Food Web Exposure to Chemicals in Soil and Surface Water)

Using less conservative and more realistic assumptions, potential risks were identified for fewer compounds and receptors, as compared to the more conservative scenario evaluated in Step 2. Potential risks were indicated to the short-tailed shrew (representative of mammalian insectivores) from exposure to Aroclor-1248, Aroclor-1260, dieldrin, pyrene, and total PAHs, and to white-footed mouse (representative of mammalian omnivores) and meadow vole (representative of mammalian herbivores) from exposure to total PAHs. Exposure doses for dieldrin and Aroclor-1248 exceedances are based on reporting limits as these compounds were not detected in the surface soils.

As for terrestrial plants and soil invertebrates, it is important to note that this site has been greatly disturbed by historic site activities, provides limited low quality habitat, is surrounding by commercial properties and the Hudson River, and will likely be developed. It is currently unknown whether shrews, mice, or voles are actually present on the property. Although small mammals could potentially use OU1, the on site habitat conditions would limit exposure, if any, to a small number of individuals until OU1 is developed. Additionally, the isolated nature of OU1 in a highly developed urban area prevents colonization by other species in the interim.

SECTION 7

Uncertainties

Uncertainties are present in all risk assessments because of the limited available data and the need to make certain assumptions and extrapolations based on incomplete information. The key uncertainties associated with the calculation of risk in this ERA are discussed in this section. Very conservative assumptions are used when calculating risks in the SLERA and, based on the conservative nature of this process; risks are likely to be overestimated. Although more realistic, the COPC refinement calculations still uses a generally conservative set of assumptions that, in most cases, are likely to overestimate rather than underestimate the likelihood and magnitude of risks to ecological receptors. The ERA results therefore should be interpreted in the context of the uncertainties discussed within this section. These primary uncertainties are attributable to the following:

- Non-detected Chemicals Exceeding Screening Values and Chemicals Without Screening Values—Non-detected chemicals with maximum-detection limits exceeding screening values and non-detected chemicals without screening values were considered COPCs, based on the conservative approach used in the SLERA. There is uncertainty associated with these chemicals. Non-detected chemicals with detection limits exceeding screening values may, for example, be present at a concentration below the detection limit but above the screening value, in which case they could have the potential to adversely affect ecological receptors. There is uncertainty associated with these chemicals and it cannot be definitively determined if they occur onsite at environmentally significant concentrations. Based on the number of samples collected at OU1 relative to the size of the site, it is unlikely that chemicals potentially posing a risk to ecological receptors would not have been detected. However, there remains some uncertainty associated with these chemicals.

  Chemicals detected but that did not have screening values also could not be quantitatively evaluated, present an uncertainty associated with the potential for ecological receptors to be adversely affected by these chemicals.

- Soil, Sediment, and Water Direct Exposure Screening Values—There is uncertainty associated with the form and bioavailability of inorganics (arsenic, chromium, and lead) in soil. In the absence of site-specific information, the form and bioavailability of the inorganics at this Site were assumed to be the same as the form and bioavailability of the inorganics used to develop the literature-based screening values. In many cases, however, the most bioavailable/toxic form of an inorganic was conservatively used to develop the literature-based screening value. Environmental factors (e.g., pH, moisture, temperature, and microbial activity) often act to make inorganics less bioavailable/toxic than those used to develop the screening values. The conservative approach used in developing the screening values is usually expected to overestimate risk.

- Ingestion Screening Values—Toxicity data for many chemicals were sparse or lacking for the selected receptor species, requiring the extrapolation of data from other wildlife species or from laboratory studies of non-wildlife species. This is a typical limitation based on the absence of toxicity data for many wildlife species. The uncertainties associated with toxicity extrapolation were, however, minimized through the careful selection of representative surrogate test species. The factors considered in selecting a surrogate species to represent another receptor species (or group of species) were taxonomic relatedness, trophic level, foraging method, and similarity of diet.

Another uncertainty related to the derivation of ingestion-screening values applies to inorganics (arsenic, chromium, and lead). Most of the toxicological studies on which the ingestion-screening values for inorganics were based used forms of the metal (such as salts) that have high water solubility and bioavailability to receptors. Since the analytical samples on which site-specific exposure estimates were based measured total metal concentration (regardless of form), except for the hexavalent chromium, and the highly bioavailable forms are expected to compose only a fraction of the total metal concentration, potential risks to wildlife are likely to be overestimated for many metals. Because the mammal ingestion-screening value for chromium is based on the hexavalent form, this concentration was used to estimate potential risks (the bird screening value is based on trivalent chromium so the total chromium concentration was used).

A third source of uncertainty associated with the derivation of ingestion-screening values concerns the use of uncertainty factors. For example, LOAELs were extrapolated to NOAELs using an uncertainty factor of 10. This approach is likely to be conservative since Dourson and Stara (1983) determined that 96 percent of the chemicals included in a data review had LOAEL-to-NOAEL ratios of five or less. The use of an uncertainty factor of 10, although potentially conservative, also serves to counter some of the uncertainty associated with interspecies extrapolations, for which a specific uncertainty factor was not used.

- Chemical Mixtures—Information on the ecotoxicological effects of chemical interactions is generally lacking, which required (as is standard for ecological risk assessments) that chemicals be evaluated on a compound-by-compound basis during the comparison to screening value. This could result in an underestimation of risk (if there are additive or synergistic effects among chemicals) or an overestimation of risks (if there are antagonistic effects among chemicals).

- Food-Web Exposure Modeling—Chemical concentrations in terrestrial food items (e.g., plants and earthworms) were modeled from measured media concentrations and not directly measured. The use of generic, literature-derived exposure models and bioaccumulation factors introduces some uncertainty into the resulting estimates. Consistent with the ERA approach, and most notably the approach used in the SLERA, the selected values and employed methodology were intended to provide a conservative estimate of potential food-web exposure concentrations and risks are likely to have been overestimated by the food-web models used in this assessment.

  Another source of uncertainty is the use of default assumptions for exposure parameters such as BCFs and BAFs. Although BCFs or BAFs for many bioaccumulative chemicals were readily available from the literature and used in the ERA, a default factor of 1.0 was used to estimate the concentration of chemicals in potential prey items when literature-based values were not available. The assumption that the chemical body burden in the potential prey item is the same as in the abiotic media is a conservative assumption for most chemicals.

Uncertainty is also introduced into the food-web exposure model for birds and mammals through the use of literature-derived exposure parameters. Because these parameters (e.g., body weight) may differ across the geographic range of a species or among individuals of the same species, the values used may not accurately represent individuals at OU1. However, this difference is expected to be minimal. Greater uncertainty results from the use of allometric models for estimating parameters such as food ingestion and water ingestion when measured data are lacking.

- Surface Soil Sample Depths – Surface soil data used in the ERA were collected at varying starting depths (0.0 to 2 inches, 0.0 to 6 inches, or 0.0 to 12 inches). Ecological receptors are typically exposed to surface soil from only 0 to 6 inches. Risks based on soil concentrations below 6 inches may overestimate or underestimate risk if subsurface concentrations are higher or lower, respectively, than surface concentrations.

SECTION 8

Ecological Risk Assessment Conclusions

The ERA results indicate the presence of COPCs at the Quanta Resources property. Using more realistic assumptions, potential risks were indicated to terrestrial plants and soil invertebrates from direct exposure to a variety of chemicals in surface soils including VOCs, SVOCs, pesticides, PCBs, and inorganics. Potential risks were also indicated to small mammal receptors from exposure to Aroclor-1248, Aroclor-1260, dieldrin, pyrene, and total PAHs. As noted the property has been greatly disturbed by historic site activities, provides low quality habitat, is surrounded by commercial properties and the Hudson River, and is slated for redevelopment. Although ecological receptors could potentially use the Quanta Resources property, these conditions would limit exposure to a small number of individual receptors that may not permanently inhabit OU1. Additionally, the isolated nature of the property prevents colonization by other species in the interim.

While the identified potential risk was developed using realistic assumptions, several areas of uncertainty still exist. At this stage the need for further risk characterization is not warranted based on the expectation of redevelopment of the property, although no specific plans for redevelopment have been made public. The potential risk identified in the SLERA will be considered during development of the FS and addressed in the remediation goals, as appropriate, if the future property use requires the consideration of ecological risks. If on the other hand, the future development plan eliminates all site habitats, potential receptors, and exposure pathways, ecological risk considerations would not be appropriate. This determination will be made as the project progresses in concert with the USEPA and the NJDEP.

SECTION 9

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Tables

TABLE 2-1
Surface Soil Summary Statistics
Quanta Resources Site, New Jersey

Chemical	Range of Non-Detect Values	Frequency of Detection	Arithmetic Mean [1]	Median [1]	Standard Deviation [1]	Maximum Detected Value	Sample ID of Maximum Detected Value	Geometric Mean [1]
Inorganics (mg/kg)								
Arsenic	NA - NA	12 / 12	1.33E+01	9.30E+00	9.44E+00	3.88E+01	SB-113C-001	1.07E+01
Chromium	NA - NA	12 / 12	2.07E+01	1.83E+01	8.08E+00	3.79E+01	SB-113C-001	1.94E+01
Hexavalent Chromium	1.60E+00 - 9.70E+00	2 / 12	1.60E+00	1.65E+00	1.49E+00	3.50E+00	SB-081505-D1	1.20E+00
Lead	NA - NA	12 / 12	1.47E+02	1.03E+02	1.21E+02	4.08E+02	SS-116B-001	1.04E+02
Pesticides/PCBs (ug/kg)								
1,2-Dibromo-3-chloropropane	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
4,4'-DDD	6.30E+01 - 1.80E+03	1 / 4	4.65E+02	6.30E+01	5.02E+02	2.90E+01	SS-103DS-001	1.65E+02
4,4'-DDE	2.10E+01 - 1.80E+03	0 / 4	4.61E+02	6.30E+01	5.08E+02	NA	NA	1.28E+02
4,4'-DDT	2.10E+01 - 1.80E+03	1 / 4	5.40E+02	3.50E+02	4.38E+02	3.50E+02	SB-113C-001	2.34E+02
Aldrin	1.10E+01 - 8.90E+02	0 / 4	2.24E+02	3.20E+01	2.46E+02	NA	NA	6.41E+01
alpha-BHC	1.10E+01 - 8.90E+02	0 / 4	2.24E+02	3.20E+01	2.46E+02	NA	NA	6.41E+01
Alpha-Chlordane	1.10E+01 - 8.90E+02	0 / 4	2.24E+02	3.20E+01	2.46E+02	NA	NA	6.41E+01
Aroclor-1016	1.80E+01 - 1.80E+04	0 / 12	1.47E+03	3.70E+01	3.35E+03	NA	NA	7.26E+01
Aroclor-1221	1.80E+01 - 1.80E+04	0 / 12	1.43E+03	3.70E+01	3.36E+03	NA	NA	6.40E+01
Aroclor-1232	1.80E+01 - 1.80E+04	0 / 12	1.45E+03	3.70E+01	3.35E+03	NA	NA	6.79E+01
Aroclor-1242	1.80E+01 - 1.80E+04	2 / 12	1.48E+03	7.40E+01	3.34E+03	5.90E+02	SS-102B-001	8.96E+01
Aroclor-1248	1.80E+01 - 3.50E+04	0 / 12	2.78E+03	3.70E+01	6.43E+03	NA	NA	8.53E+01
Aroclor-1254	1.80E+01 - 1.80E+04	3 / 12	1.48E+03	4.25E+01	3.34E+03	5.00E+02	SS-116B-001	9.36E+01
Aroclor-1260	2.00E+01 - 3.50E+04	8 / 12	2.90E+03	1.34E+02	6.38E+03	1.10E+03	SS-116B-001	2.26E+02
beta-BHC	1.10E+01 - 8.90E+02	0 / 4	2.24E+02	3.20E+01	2.46E+02	NA	NA	6.41E+01
beta-Chlordane	6.50E+01 - 3.20E+03	0 / 4	8.19E+02	1.90E+02	8.73E+02	NA	NA	2.96E+02
delta-BHC	1.40E+01 - 8.90E+02	0 / 4	2.26E+02	4.00E+01	2.45E+02	NA	NA	7.19E+01
Dieldrin	2.10E+01 - 1.80E+03	0 / 4	4.61E+02	6.30E+01	5.08E+02	NA	NA	1.28E+02
Endosulfan I	1.10E+01 - 8.90E+02	0 / 4	2.24E+02	3.20E+01	2.46E+02	NA	NA	6.41E+01
Endosulfan II	2.10E+01 - 1.80E+03	0 / 4	4.61E+02	6.30E+01	5.08E+02	NA	NA	1.28E+02
Endosulfan Sulfate	2.10E+01 - 1.80E+03	0 / 4	4.61E+02	6.30E+01	5.08E+02	NA	NA	1.28E+02
Endrin	2.10E+01 - 1.80E+03	0 / 4	4.61E+02	6.30E+01	5.08E+02	NA	NA	1.28E+02
Endrin Aldehyde	2.10E+01 - 1.80E+03	0 / 4	4.61E+02	6.30E+01	5.08E+02	NA	NA	1.28E+02
Endrin Ketone	2.10E+01 - 1.80E+03	0 / 4	4.61E+02	6.30E+01	5.08E+02	NA	NA	1.28E+02
gamma-BHC (Lindane)	1.10E+01 - 8.90E+02	0 / 4	2.24E+02	3.20E+01	2.46E+02	NA	NA	6.41E+01
Heptachlor	1.10E+01 - 8.90E+02	0 / 4	2.24E+02	3.20E+01	2.46E+02	NA	NA	6.41E+01
Heptachlor Epoxide	1.10E+01 - 8.90E+02	0 / 4	2.24E+02	3.20E+01	2.46E+02	NA	NA	6.41E+01
Methoxychlor	1.10E+02 - 8.90E+03	0 / 4	2.24E+03	3.20E+02	2.46E+03	NA	NA	6.41E+02
Toxaphene	7.10E+02 - 3.50E+04	0 / 4	8.98E+03	2.10E+03	9.56E+03	NA	NA	3.25E+03
SVOCs (ug/kg)								
1,1'-Biphenyl	2.20E+02 - 1.80E+04	9 / 12	1.51E+04	5.35E+03	2.95E+04	1.10E+05	SB-118B-002/ SS-03C-001	4.17E+03
1,2,4-Trichlorobenzene	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
1,2-Dichlorobenzene	5.00E+00 - 4.40E+03	1 / 12	5.47E+02	1.70E+02	9.30E+02	2.90E+03	SS-102B-001	5.32E+01
1,3-Dichlorobenzene	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01

TABLE 2-1
Surface Soil Summary Statistics
Quanta Resources Site, New Jersey

Chemical	Range of Non-Detect Values	Frequency of Detection	Arithmetic Mean [1]	Median [1]	Standard Deviation [1]	Maximum Detected Value	Sample ID of Maximum Detected Value	Geometric Mean [1]
1,4-Dichlorobenzene	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
2,2'-Oxybis(1-Chloropropane)	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
2,4,5-Trichlorophenol	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
2,4,6-Trichlorophenol	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
2,4-Dichlorophenol	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
2,4-Dimethylphenol	1.90E+02 - 1.90E+04	3 / 12	4.18E+03	4.80E+03	3.36E+03	6.00E+03	SS-112A-001	2.29E+03
2,4-Dinitrophenol	2.20E+03 - 2.20E+05	0 / 12	4.43E+04	5.10E+04	3.98E+04	NA	NA	2.33E+04
2,4-Dinitrotoluene	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
2,6-Dinitrotoluene	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
2-Chloronaphthalene	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
2-Chlorophenol	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
2-Methylnaphthalene	NA - NA	12 / 12	9.09E+04	1.70E+04	2.28E+05	8.40E+05	SS-03C-001	1.34E+04
2-Methylphenol	1.90E+02 - 1.90E+04	2 / 12	3.97E+03	4.20E+03	3.34E+03	3.70E+03	SS-112A-001	2.17E+03
2-Nitroaniline	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
2-Nitrophenol	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
3,3'-Dichlorobenzidine	3.70E+02 - 3.60E+04	0 / 12	7.39E+03	8.45E+03	6.62E+03	NA	NA	3.87E+03
3-Nitroaniline	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
4,6-Dinitro-2-methylphenol	5.60E+02 - 5.50E+04	0 / 12	1.12E+04	1.30E+04	1.00E+04	NA	NA	5.87E+03
4-Bromophenyl Phenyl Ether	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
4-Chloro-3-Methylphenol	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
4-Chloroaniline	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
4-Chlorophenyl Phenyl Ether	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
4-Methylphenol	1.90E+02 - 1.90E+04	3 / 12	4.17E+03	4.25E+03	3.23E+03	4.00E+03	SS-112A-001	2.36E+03
4-Nitroaniline	1.90E+02 - 1.90E+04	1 / 12	3.91E+03	4.20E+03	3.38E+03	3.60E+03	SS-112A-001	2.07E+03
4-Nitrophenol	5.60E+02 - 5.50E+04	0 / 12	1.12E+04	1.30E+04	1.00E+04	NA	NA	5.87E+03
Acenaphthene	NA - NA	12 / 12	5.83E+04	2.50E+04	6.00E+04	2.00E+05	SS-03C-001	2.30E+04
Acenaphthylene	NA - NA	12 / 12	1.64E+04	9.45E+03	1.62E+04	5.30E+04	SS-102B-001	8.87E+03
Acetophenone	1.90E+02 - 1.90E+04	1 / 12	3.83E+03	4.00E+03	3.41E+03	2.80E+03	SS-03C-001	2.01E+03
Anthracene	NA - NA	12 / 12	9.21E+04	8.65E+04	6.75E+04	2.20E+05	SS-102B-001	5.14E+04
Atrazine	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
Benzaldehyde	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
Benzo(a)anthracene	NA - NA	12 / 12	1.47E+05	8.25E+04	1.48E+05	4.60E+05	SS-118B-001	7.34E+04
Benzo(a)pyrene	NA - NA	12 / 12	1.51E+05	7.35E+04	1.68E+05	5.30E+05	SS-118B-001	7.15E+04
Benzo(b)fluoranthene	NA - NA	12 / 12	1.88E+05	9.50E+04	2.03E+05	6.60E+05	SS-118B-001	9.08E+04
Benzo(g,h,i)perylene	NA - NA	12 / 12	8.78E+04	4.05E+04	9.59E+04	3.00E+05	SS-118B-001	4.22E+04
Benzo(k)fluoranthene	NA - NA	12 / 12	7.93E+04	4.20E+04	8.14E+04	2.40E+05	SS-118B-001/ SB-117B-001	3.94E+04
Bis(2-chloroethoxy)methane	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
Bis(2-chloroethyl)ether	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
Bis(2-ethylhexyl)phthalate	6.90E+03 - 3.50E+04	7 / 12	8.63E+03	7.45E+03	7.96E+03	2.60E+04	SS-116B-001	4.93E+03
Butylbenzylphthalate	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
Caprolactam	1.90E+02 - 1.90E+04	1 / 12	3.79E+03	4.20E+03	3.42E+03	1.20E+03	SS-102B-001	2.00E+03
Carbazole	NA - NA	12 / 12	3.32E+04	2.45E+04	2.85E+04	1.00E+05	SS-102B-001	1.71E+04
Chrysene	NA - NA	12 / 12	1.55E+05	8.80E+04	1.54E+05	4.90E+05	SS-118B-001	7.66E+04

TABLE 2-1
Surface Soil Summary Statistics
Quanta Resources Site, New Jersey

Chemical	Range of Non-Detect Values	Frequency of Detection	Arithmetic Mean [1]	Median [1]	Standard Deviation [1]	Maximum Detected Value	Sample ID of Maximum Detected Value	Geometric Mean [1]
Di-n-butylphthalate	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
Di-n-octylphthalate	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
Dibenz(a,h)anthracene	NA - NA	12 / 12	2.70E+04	1.25E+04	3.04E+04	1.00E+05	SS-118B-001	1.27E+04
Dibenzofuran	NA - NA	12 / 12	4.03E+04	2.50E+04	4.26E+04	1.50E+05	SS-102B-001	1.69E+04
Diethylphthalate	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
Dimethylphthalate	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
Fluoranthene	NA - NA	12 / 12	3.08E+05	2.15E+05	2.56E+05	7.30E+05	SB-117B-001	1.70E+05
Fluorene	NA - NA	12 / 12	7.23E+04	4.30E+04	7.72E+04	2.50E+05	SS-03C-001	3.07E+04
Hexachlorobenzene	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
Hexachlorobutadiene	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
Hexachlorocyclopentadiene	5.60E+02 - 5.50E+04	0 / 12	1.12E+04	1.30E+04	1.00E+04	NA	NA	5.87E+03
Hexachloroethane	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
Indeno(1,2,3-cd)pyrene	NA - NA	12 / 12	8.12E+04	3.50E+04	8.73E+04	2.70E+05	SS-118B-001	3.90E+04
Isophorone	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
N-Nitroso-di-n-propylamine	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
N-Nitrosodiphenylamine	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
Naphthalene	NA - NA	12 / 12	2.05E+05	3.00E+04	4.95E+05	1.80E+06	SS-03C-001	2.80E+04
Nitrobenzene	1.90E+02 - 1.90E+04	0 / 12	3.76E+03	4.20E+03	3.44E+03	NA	NA	1.96E+03
Pentachlorophenol	5.60E+02 - 5.50E+04	0 / 12	1.12E+04	1.30E+04	1.00E+04	NA	NA	5.87E+03
Phenanthrene	NA - NA	12 / 12	3.05E+05	2.40E+05	2.46E+05	8.00E+05	SS-102B-001	1.58E+05
Phenol	1.90E+02 - 1.90E+04	5 / 12	3.75E+03	3.20E+03	3.45E+03	2.90E+03	SS-102B-001	2.07E+03
Pyrene	NA - NA	12 / 12	2.71E+05	1.90E+05	2.31E+05	7.30E+05	SS-118B-001	1.48E+05
VOCs (ug/kg)								
1,1,1-Trichloroethane	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
1,1,2,2-Tetrachloroethane	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
1,1,2-Trichloroethane	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
1,1,2-Trichlorotrifluoroethane	1.10E+01 - 8.80E+03	0 / 12	7.09E+02	3.35E+02	1.21E+03	NA	NA	9.37E+01
1,1-Dichloroethane	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
1,1-Dichloroethene	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
1,2-Dibromo-3-Chloropropane	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
1,2-Dibromoethane	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
1,2-Dichloroethane	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
1,2-Dichloropropane	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
2-Butanone	1.10E+01 - 8.80E+03	1 / 12	7.10E+02	3.35E+02	1.21E+03	1.50E+01	SS-116B-001	9.99E+01
2-Hexanone	1.10E+01 - 8.80E+03	0 / 12	7.09E+02	3.35E+02	1.21E+03	NA	NA	9.37E+01
4-Methyl-2-pentanone	1.10E+01 - 8.80E+03	0 / 12	7.09E+02	3.35E+02	1.21E+03	NA	NA	9.37E+01
Acetone	3.70E+01 - 1.80E+04	5 / 12	1.44E+03	7.05E+02	2.46E+03	1.10E+02	SS-116B-001	2.68E+02
Benzene	6.00E+00 - 5.90E+02	9 / 12	4.80E+02	4.55E+01	7.84E+02	2.10E+03	SS-03C-001	3.97E+01
Bromodichloromethane	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
Bromoform	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
Bromomethane	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
Carbon Disulfide	9.00E+00 - 4.40E+03	5 / 12	3.57E+02	1.70E+02	6.05E+02	4.00E+00	SS-07G-001	4.11E+01
Carbon Tetrachloride	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01

TABLE 2-1
Surface Soil Summary Statistics
Quanta Resources Site, New Jersey

Chemical	Range of Non-Detect Values	Frequency of Detection	Arithmetic Mean [1]	Median [1]	Standard Deviation [1]	Maximum Detected Value	Sample ID of Maximum Detected Value	Geometric Mean [1]
Chlorobenzene	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
Chlorodibromomethane	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
Chloroethane	4.00E+00 - 3.50E+03	0 / 12	2.98E+02	1.34E+02	4.81E+02	NA	NA	3.95E+01
Chloroform	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
Chloromethane	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
cis-1,2-Dichloroethene	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
cis-1,3-Dichloropropene	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
Cyclohexane	5.00E+00 - 4.40E+03	1 / 12	3.57E+02	1.68E+02	6.05E+02	3.00E+00	SS-118B-001	4.45E+01
Dichlorodifluoromethane	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
Ethylbenzene	5.00E+00 - 5.90E+02	8 / 12	6.08E+02	4.50E+01	1.60E+03	5.90E+03	SS-03C-001	4.47E+01
Isopropylbenzene	5.00E+00 - 4.60E+02	6 / 12	3.81E+02	1.20E+02	5.09E+02	1.30E+03	SS-03C-001	5.01E+01
Methyl Acetate	5.00E+00 - 4.40E+03	2 / 12	4.33E+02	1.80E+02	6.34E+02	1.10E+03	SS-103DS-001	5.39E+01
Methyl tert-butyl Ether	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
Methylcyclohexane	5.00E+00 - 4.40E+03	1 / 12	3.57E+02	1.68E+02	6.05E+02	6.00E+00	SS-118B-001	4.70E+01
Methylene Chloride	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
Styrene	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
Tetrachloroethene	6.00E+00 - 4.40E+03	2 / 12	3.64E+02	1.70E+02	6.06E+02	5.20E+02	SS-102B-001	4.99E+01
Toluene	6.00E+00 - 5.90E+02	9 / 12	9.37E+02	4.95E+01	1.62E+03	4.30E+03	SS-03C-001	6.49E+01
trans-1,2-Dichloroethene	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
trans-1,3-Dichloropropene	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
Trichloroethene	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
Trichlorofluoromethane	5.00E+00 - 4.40E+03	1 / 12	1.25E+03	1.70E+02	3.29E+03	1.20E+04	SS-102B-001	5.93E+01
Vinyl Chloride	5.00E+00 - 4.40E+03	0 / 12	3.57E+02	1.70E+02	6.05E+02	NA	NA	4.59E+01
Xylene (Total)	6.00E+00 - 5.90E+02	9 / 12	3.71E+03	7.20E+01	6.45E+03	2.10E+04	SS-03C-001	1.06E+02
Soil Quality Parameters (mg/kg)								
Ammonia	2.64E+02 - 2.72E+02	0 / 2	1.34E+02	2.64E+02	2.83E+00	NA	NA	1.34E+02

[1] One-half of the reporting limit was used for non-detected samples in calculation

NA = Not applicable because the chemical was either detected in all samples or not detected in any sample

TABLE 2-2
Surface Water Summary Statistics
Quanta Resources Site, New Jersey

Chemical	Range of Non-Detect Values	Frequency of Detection	Arithmetic Mean [1]	Median [1]	Standard Deviation [1]	Maximum Detected Value	Sample ID of Maximum Detected Value	Geometric Mean [1]
Pesticides/PCBs (ug/L)								
4,4'-DDD	1.90E-02 - 1.90E-01	0 / 4	3.09E-02	9.50E-03	4.28E-02	NA	NA	1.69E-02
4,4'-DDE	1.90E-02 - 1.90E-02	1 / 4	3.96E-02	9.50E-03	6.03E-02	1.30E-01	30916SW-D-111705	1.83E-02
4,4'-DDT	1.90E-02 - 1.90E-02	1 / 4	1.22E-01	9.50E-03	2.25E-01	4.60E-01	30916SW-D-111705	2.51E-02
Aldrin	1.90E-02 - 1.90E-01	0 / 4	3.09E-02	9.50E-03	4.28E-02	NA	NA	1.69E-02
alpha-BHC	9.60E-03 - 9.60E-02	2 / 4	1.58E-02	5.35E-03	2.15E-02	5.90E-03	30916SW-A-111705	8.89E-03
alpha-Chlordane	9.60E-03 - 9.60E-02	0 / 4	1.56E-02	4.80E-03	2.16E-02	NA	NA	8.54E-03
Aroclor-1016	4.80E-01 - 4.80E+00	0 / 4	7.80E-01	2.40E-01	1.08E+00	NA	NA	4.27E-01
Aroclor-1221	4.80E-01 - 4.80E+00	0 / 4	7.80E-01	2.40E-01	1.08E+00	NA	NA	4.27E-01
Aroclor-1232	4.80E-01 - 4.80E+00	0 / 4	7.80E-01	2.40E-01	1.08E+00	NA	NA	4.27E-01
Aroclor-1242	4.80E-01 - 4.80E+00	0 / 4	7.80E-01	2.40E-01	1.08E+00	NA	NA	4.27E-01
Aroclor-1248	4.80E-01 - 4.80E+00	0 / 4	7.80E-01	2.40E-01	1.08E+00	NA	NA	4.27E-01
Aroclor-1254	4.80E-01 - 4.80E+00	0 / 4	7.80E-01	2.40E-01	1.08E+00	NA	NA	4.27E-01
Aroclor-1260	4.80E-01 - 4.80E+00	0 / 4	7.80E-01	2.40E-01	1.08E+00	NA	NA	4.27E-01
beta-BHC	3.80E-02 - 3.90E-01	0 / 4	6.31E-02	1.93E-02	8.79E-02	NA	NA	3.42E-02
beta-Chlordane	9.60E-02 - 9.60E-01	0 / 4	1.56E-01	4.80E-02	2.16E-01	NA	NA	8.54E-02
delta-BHC	9.60E-03 - 9.60E-02	2 / 4	1.72E-02	7.90E-03	2.06E-02	8.00E-03	30916SW-A-111705	1.10E-02
Dieldrin	2.90E-02 - 2.90E-01	0 / 4	4.71E-02	1.45E-02	6.53E-02	NA	NA	2.58E-02
Endosulfan I	9.60E-03 - 9.60E-02	0 / 4	1.56E-02	4.80E-03	2.16E-02	NA	NA	8.54E-03
Endosulfan II	1.90E-02 - 1.90E-01	0 / 4	3.09E-02	9.50E-03	4.28E-02	NA	NA	1.69E-02
Endosulfan Sulfate	1.90E-02 - 1.90E-01	0 / 4	3.09E-02	9.50E-03	4.28E-02	NA	NA	1.69E-02
Endrin	1.90E-02 - 1.90E-01	0 / 4	3.09E-02	9.50E-03	4.28E-02	NA	NA	1.69E-02
Endrin Aldehyde	9.60E-02 - 9.60E-01	0 / 4	1.56E-01	4.80E-02	2.16E-01	NA	NA	8.54E-02
Endrin Ketone	1.90E-02 - 1.90E-01	0 / 4	3.09E-02	9.50E-03	4.28E-02	NA	NA	1.69E-02
gamma-BHC (Lindane)	9.60E-02 - 9.60E-02	3 / 4	1.51E-02	4.95E-03	2.20E-02	6.80E-03	30916SW-B-111705	7.02E-03
Heptachlor	9.60E-03 - 9.60E-02	0 / 4	1.56E-02	4.80E-03	2.16E-02	NA	NA	8.54E-03
Heptachlor Epoxide	9.60E-03 - 9.60E-02	0 / 4	1.56E-02	4.80E-03	2.16E-02	NA	NA	8.54E-03
Methoxychlor	9.60E-02 - 9.60E-01	0 / 4	1.56E-01	4.80E-02	2.16E-01	NA	NA	8.54E-02
Toxaphene	9.60E-01 - 9.60E+00	0 / 4	1.56E+00	4.80E-01	2.16E+00	NA	NA	8.54E-01
SVOCs (ug/L)								
1,1'-Biphenyl	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
1,2,4-Trichlorobenzene	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
1,2-Dichlorobenzene	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
1,3-Dichlorobenzene	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
1,4-Dichlorobenzene	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
2,2'-Oxybis(1-Chloropropane)	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00

TABLE 2-2
Surface Water Summary Statistics
Quanta Resources Site, New Jersey

Chemical	Range of Non-Detect Values	Frequency of Detection	Arithmetic Mean [1]	Median [1]	Standard Deviation [1]	Maximum Detected Value	Sample ID of Maximum Detected Value	Geometric Mean [1]
2,4,5-Trichlorophenol	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
2,4,6-Trichlorophenol	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
2,4-Dichlorophenol	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
2,4-Dimethylphenol	1.00E+01 - 1.00E+01	0 / 4	5.00E+00	5.00E+00	0.00E+00	NA	NA	5.00E+00
2,4-Dinitrophenol	5.70E+01 - 5.80E+01	0 / 4	2.86E+01	2.85E+01	2.50E-01	NA	NA	2.86E+01
2,4-Dinitrotoluene	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
2,6-Dinitrotoluene	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
2-Chloronaphthalene	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
2-Chlorophenol	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
2-Methylnaphthalene	5.00E+00 - 5.00E+00	1 / 4	2.13E+00	2.50E+00	7.50E-01	1.00E+00	30916SW-D-111705	1.99E+00
2-Methylphenol	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
2-Nitroaniline	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
2-Nitrophenol	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
3,3'-Dichlorobenzidine	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
3-Nitroaniline	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
4,6-Dinitro-2-Methylphenol	1.40E+01 - 1.40E+01	0 / 4	7.00E+00	7.00E+00	0.00E+00	NA	NA	7.00E+00
4-Bromophenyl Phenyl Ether	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
4-Chloro-3-Methylphenol	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
4-Chloroaniline	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
4-Chlorophenyl Phenyl Ether	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
4-Methylphenol	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
4-Nitroaniline	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
4-Nitrophenol	2.90E+01 - 2.90E+01	0 / 4	1.45E+01	1.45E+01	0.00E+00	NA	NA	1.45E+01
Acenaphthene	5.00E+00 - 5.00E+00	1 / 4	3.38E+00	2.50E+00	1.75E+00	6.00E+00	30916SW-D-111705	3.11E+00
Acenaphthylene	5.00E+00 - 5.00E+00	1 / 4	3.88E+00	2.50E+00	2.75E+00	8.00E+00	30916SW-D-111705	3.34E+00
Acetophenone	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
Anthracene	5.00E+00 - 5.00E+00	1 / 4	5.38E+00	2.50E+00	5.75E+00	1.40E+01	30916SW-D-111705	3.85E+00
Atrazine	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
Benzaldehyde	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
Benzo(a)anthracene	5.00E+00 - 5.00E+00	2 / 4	1.40E+01	2.50E+00	2.40E+01	5.00E+01	30916SW-D-111705	4.20E+00
Benzo(a)pyrene	5.00E+00 - 5.00E+00	3 / 4	1.66E+01	1.75E+00	3.03E+01	6.20E+01	30916SW-D-111705	3.53E+00
Benzo(b)fluoranthene	5.00E+00 - 5.00E+00	3 / 4	2.49E+01	2.25E+00	4.61E+01	9.40E+01	30916SW-D-111705	4.66E+00
Benzo(g,h,i)perylene	5.00E+00 - 5.00E+00	3 / 4	1.26E+01	1.75E+00	2.23E+01	4.60E+01	30916SW-D-111705	3.27E+00
Benzo(k)fluoranthene	5.00E+00 - 5.00E+00	2 / 4	1.05E+01	2.50E+00	1.70E+01	3.60E+01	30916SW-D-111705	3.87E+00
Bis(2-chloroethoxy)methane	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
Bis(2-chloroethyl)ether	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
Bis(2-ethylhexyl)phthalate	5.00E+00 - 5.00E+00	1 / 4	2.38E+00	2.50E+00	2.50E-01	2.00E+00	30916SW-D-111705	2.36E+00

TABLE 2-2
Surface Water Summary Statistics
Quanta Resources Site, New Jersey

Chemical	Range of Non-Detect Values	Frequency of Detection	Arithmetic Mean [1]	Median [1]	Standard Deviation [1]	Maximum Detected Value	Sample ID of Maximum Detected Value	Geometric Mean [1]
Butylbenzyl Phthalate	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
Caprolactam	1.40E+01 - 1.40E+01	0 / 4	7.00E+00	7.00E+00	0.00E+00	NA	NA	7.00E+00
Carbazole	5.00E+00 - 5.00E+00	1 / 4	3.88E+00	2.50E+00	2.75E+00	8.00E+00	30916SW-D-111705	3.34E+00
Chrysene	5.00E+00 - 5.00E+00	3 / 4	1.81E+01	1.75E+00	3.33E+01	6.80E+01	30916SW-D-111705	3.61E+00
Dibenzo(a,h)anthracene	5.00E+00 - 5.00E+00	1 / 4	4.88E+00	2.50E+00	4.75E+00	1.20E+01	30916SW-D-111705	3.70E+00
Dibenzofuran	5.00E+00 - 5.00E+00	1 / 4	2.63E+00	2.50E+00	2.50E-01	3.00E+00	30916SW-D-111705	2.62E+00
Diethyl Phthalate	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
Dimethyl Phthalate	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
Di-n-butylphthalate	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
Di-n-octylphthalate	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
Fluoranthene	5.00E+00 - 5.00E+00	3 / 4	2.89E+01	2.25E+00	5.41E+01	1.10E+02	30916SW-D-111705	4.84E+00
Fluorene	5.00E+00 - 5.00E+00	1 / 4	3.13E+00	2.50E+00	1.25E+00	5.00E+00	30916SW-D-111705	2.97E+00
Hexachlorobenzene	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
Hexachlorobutadiene	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
Hexachlorocyclopentadiene	1.40E+01 - 1.40E+01	0 / 4	7.00E+00	7.00E+00	0.00E+00	NA	NA	7.00E+00
Hexachloroethane	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
Indeno(1,2,3-cd)pyrene	5.00E+00 - 5.00E+00	2 / 4	1.18E+01	2.50E+00	1.95E+01	4.10E+01	30916SW-D-111705	4.00E+00
Isophorone	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
Naphthalene	5.00E+00 - 5.00E+00	1 / 4	2.63E+00	2.50E+00	2.50E-01	3.00E+00	30916SW-D-111705	2.62E+00
Nitrobenzene	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
N-Nitroso-di-n-propylamine	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
N-Nitrosodiphenylamine	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
Pentachlorophenol	1.40E+01 - 1.40E+01	0 / 4	7.00E+00	7.00E+00	0.00E+00	NA	NA	7.00E+00
Phenanthrene	5.00E+00 - 5.00E+00	1 / 4	1.59E+01	2.50E+00	2.68E+01	5.60E+01	30916SW-D-111705	5.44E+00
Phenol	5.00E+00 - 5.00E+00	0 / 4	2.50E+00	2.50E+00	0.00E+00	NA	NA	2.50E+00
Pyrene	5.00E+00 - 5.00E+00	3 / 4	2.64E+01	2.25E+00	4.91E+01	1.00E+02	30916SW-D-111705	4.73E+00
VOCs (ug/L)								
1,1,1-Trichloroethane	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
1,1,2,2-Tetrachloroethane	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
1,1,2-Trichloroethane	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
1,1,2-Trichlorotrifluoroethane	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
1,1-Dichloroethane	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
1,1-Dichloroethene	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
1,2-Dibromo-3-Chloropropane	2.00E+00 - 1.00E+01	0 / 4	3.00E+00	3.00E+00	2.31E+00	NA	NA	2.24E+00
1,2-Dibromoethane	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
1,2-Dichloroethane	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01

TABLE 2-2
Surface Water Summary Statistics
Quanta Resources Site, New Jersey

Chemical	Range of Non-Detect Values	Frequency of Detection	Arithmetic Mean [1]	Median [1]	Standard Deviation [1]	Maximum Detected Value	Sample ID of Maximum Detected Value	Geometric Mean [1]
1,2-Dichloropropane	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
2-Butanone	5.00E+00 - 2.50E+01	0 / 4	7.50E+00	7.50E+00	5.77E+00	NA	NA	5.59E+00
2-Hexanone	5.00E+00 - 2.50E+01	0 / 4	7.50E+00	7.50E+00	5.77E+00	NA	NA	5.59E+00
4-Methyl-2-Pentanone	5.00E+00 - 2.50E+01	0 / 4	7.50E+00	7.50E+00	5.77E+00	NA	NA	5.59E+00
Acetone	2.50E+01 - 2.50E+01	2 / 4	8.88E+00	9.65E+00	4.37E+00	6.80E+00	30916SW-C-111705	7.92E+00
Benzene	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Bromodichloromethane	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Bromoform	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Bromomethane	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Carbon Disulfide	5.00E-01 - 2.50E+00	1 / 4	7.13E-01	7.50E-01	6.24E-01	1.00E-01	30916SW-C-111705	4.45E-01
Carbon Tetrachloride	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Chlorobenzene	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Chlorodibromomethane	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Chloroethane	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Chloroform	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Chloromethane	5.00E-01 - 5.00E-01	2 / 4	4.00E-01	3.75E-01	1.78E-01	6.00E-01	30916SW-D-111705	3.70E-01
cis-1,2-Dichloroethene	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
cis-1,3-Dichloropropene	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Cyclohexane	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Dichlorodifluoromethane	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Ethylbenzene	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Isopropylbenzene	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Methyl Acetate	1.00E+00 - 5.00E+00	0 / 4	1.50E+00	1.50E+00	1.15E+00	NA	NA	1.12E+00
Methyl tert-butyl Ether	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Methylcyclohexane	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Methylene Chloride	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Styrene	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Tetrachloroethene	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Toluene	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
trans-1,2-Dichloroethene	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
trans-1,3-Dichloropropene	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Trichloroethene	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Trichlorofluoromethane	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Vinyl Chloride	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01
Xylenes, Total	5.00E-01 - 2.50E+00	0 / 4	7.50E-01	7.50E-01	5.77E-01	NA	NA	5.59E-01

TABLE 2-2
Surface Water Summary Statistics
Quanta Resources Site, New Jersey

Chemical	Range of Non-Detect Values	Frequency of Detection	Arithmetic Mean [1]	Median [1]	Standard Deviation [1]	Maximum Detected Value	Sample ID of Maximum Detected Value	Geometric Mean [1]
Surface Water Quality Parameters (mg/L)								
Ammonia	5.00E-01 - 5.00E-01	3 / 4	3.15E-01	3.15E-01	5.69E-02	3.80E-01	30916SW-A-111705	3.11E-01

[1] One-half of the reporting limit was used for non-detected samples in calculation
NA = Not applicable because the chemical was either detected in all samples or not detected in any sample

TABLE 2-3
Assessment and Measurement Endpoints
Quanta Resources Site, New Jersey

Assessment Endpoint	Measurement Endpoint	Receptor
Survival, growth, and reproduction of terrestrial soil invertebrate communities	Comparison of screening values for soil invertebrates with chemical concentrations in surface soil	Soil invertebrates (earthworms)
Survival, growth, and reproduction of terrestrial plant communities	Comparison of screening values for terrestrial plants with chemical concentrations in surface soil	Terrestrial plants
Survival, growth, and reproduction of avian terrestrial insectivores/omnivores	Comparison of chronic ingestion-based screening values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on surface soil concentrations	American robin
Survival, growth, and reproduction of avian terrestrial carnivores	Comparison of chronic ingestion-based screening values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on surface soil concentrations	Red-tailed hawk
Survival, growth, and reproduction of mammalian terrestrial omnivore	Comparison of chronic ingestion-based screening values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on surface soil and surface water concentrations	White-footed mouse
Survival, growth, and reproduction of mammalian terrestrial insectivores	Comparison of chronic ingestion-based screening values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on surface soil and surface water concentrations	Short-tailed shrew
Survival, growth, and reproduction of mammalian terrestrial herbivores	Comparison of chronic ingestion-based screening values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on surface soil and surface water concentrations	Meadow vole
Survival, growth, and reproduction of mammalian terrestrial carnivores	Comparison of chronic ingestion-based screening values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on surface soil and surface water concentrations	Long-tailed weasel
Survival, growth, and reproduction of mammalian semi-aquatic omnivores	Comparison of chronic ingestion-based screening values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on surface soil and surface water concentrations	Raccoon

TABLE 3-1
Surface Soil Screening Values - Step 2
Quanta Resources Site, New Jersey

Chemical	Screening Value	Reference	Comments
Inorganics (mg/kg)			
Arsenic	1.80E+01	USEPA 2005a	Lower of plant and soil invertebrate value
Chromium	4.00E-01	Efroymson et al. 1997	
Hexavalent Chromium	No Screening Value		
Lead	1.20E+02	USEPA 2005b	Lower of plant and soil invertebrate value
Pesticides/PCBs (ug/kg)			
4,4'-DDD	2.00E+03	MSPE 1994	Mean of target and intervention values; Value for sum of DDD, DDE, and DDT
4,4'-DDE	2.00E+03	MSPE 1994	Mean of target and intervention values; Value for sum of DDD, DDE, and DDT
4,4'-DDT	2.00E+03	MSPE 1994	Mean of target and intervention values; Value for sum of DDD, DDE, and DDT
Aldrin	2.50E+00	Friday 1998	
alpha-BHC	2.50E+00	Friday 1998	
alpha-Chlordane	No Screening Value		
Aroclor-1016	2.51E+03	USEPA 1999	Lower of plant and soil invertebrate value; Aroclor-1254 value used
Aroclor-1221	2.51E+03	USEPA 1999	Lower of plant and soil invertebrate value; Aroclor-1254 value used
Aroclor-1232	2.51E+03	USEPA 1999	Lower of plant and soil invertebrate value; Aroclor-1254 value used
Aroclor-1242	2.51E+03	USEPA 1999	Lower of plant and soil invertebrate value; Aroclor-1254 value used
Aroclor-1248	2.51E+03	USEPA 1999	Lower of plant and soil invertebrate value; Aroclor-1254 value used
Aroclor-1254	2.51E+03	USEPA 1999	Lower of plant and soil invertebrate value
Aroclor-1260	2.51E+03	USEPA 1999	Lower of plant and soil invertebrate value; Aroclor-1254 value used
beta-BHC	No Screening Value		
beta-Chlordane	No Screening Value		
delta-BHC	No Screening Value		
Dieldrin	5.00E-01	Friday 1998	
Endosulfan I	No Screening Value		
Endosulfan II	No Screening Value		
Endosulfan sulfate	No Screening Value		
Endrin	1.00E+00	Friday 1998	
Endrin aldehyde	No Screening Value		
Endrin ketone	No Screening Value		
gamma-BHC (Lindane)	No Screening Value		
Heptachlor	No Screening Value		
Heptachlor epoxide	No Screening Value		
Methoxychlor	No Screening Value		
Toxaphene	No Screening Value		
SVOCs (ug/kg)			
1,1'-Biphenyl	6.00E+04	Efroymson et al. 1997	
1,2,4-Trichlorobenzene	2.00E+04	Efroymson et al. 1997	
1,2-Dichlorobenzene	2.00E+04	Efroymson et al. 1997	Value for 1,4-Dichlorobenzene
1,3-Dichlorobenzene	2.00E+04	Efroymson et al. 1997	Value for 1,4-Dichlorobenzene
1,4-Dichlorobenzene	2.00E+04	Efroymson et al. 1997	
2,2'-oxybis(1-Chloropropane)	No Screening Value		

TABLE 3-1
Surface Soil Screening Values - Step 2
Quanta Resources Site, New Jersey

Chemical	Screening Value	Reference	Comments
2,4,5-Trichlorophenol	9.00E+03	Efroymson et al. 1997	
2,4,6-Trichlorophenol	4.00E+03	Efroymson et al. 1997	
2,4-Dichlorophenol	2.00E+04	Friday 1998	Value for 3,4-dichlorophenol
2,4-Dimethylphenol	No Screening Value		
2,4-Dinitrophenol	No Screening Value		
2,4-Dinitrotoluene	No Screening Value		
2,6-Dinitrotoluene	No Screening Value		
2-Chloronaphthalene	No Screening Value		
2-Chlorophenol	1.00E+01	Friday 1998	
2-Methylnaphthalene	No Screening Value		
2-Methylphenol	No Screening Value		
2-Nitroaniline	No Screening Value		
2-Nitrophenol	7.00E+03	Friday 1998	Value for 4-nitrophenol
3,3'-Dichlorobenzidine	No Screening Value		
3-Nitroaniline	No Screening Value		
4,6-Dinitro-2-methylphenol	No Screening Value		
4-Bromophenyl-phenylether	No Screening Value		
4-Chloro-3-methylphenol	No Screening Value		
4-Chloroaniline	No Screening Value		
4-Chlorophenyl-phenylether	No Screening Value		
4-Methylphenol	No Screening Value		
4-Nitroaniline	No Screening Value		
4-Nitrophenol	7.00E+03	Efroymson et al. 1997	
Acenaphthene	2.00E+04	Efroymson et al. 1997	
Acenaphthylene	2.00E+04	Efroymson et al. 1997	Value for Acenaphthene
Acetophenone	No Screening Value		
Anthracene	1.00E+02	Friday 1998	
Atrazine	6.00E+02	MHSPE 1994	Mean of target and intervention values
Benzaldehyde	No Screening Value		
Benzo(a)anthracene	1.00E+02	Friday 1998	Value for benzo(a)pyrene
Benzo(a)pyrene	1.00E+02	Friday 1998	
Benzo(b)fluoranthene	1.00E+02	Friday 1998	Value for benzo(a)pyrene
Benzo(g,h,i)perylene	1.00E+02	Friday 1998	Value for benzo(a)pyrene
Benzo(k)fluoranthene	1.00E+02	Friday 1998	Value for benzo(a)pyrene
bis(2-Chloroethoxy)methane	No Screening Value		
bis(2-Chloroethyl)ether	No Screening Value		
bis(2-Ethylhexyl)phthalate	3.01E+04	MHSPE 1994	Mean of target and intervention values; Value for total phthalates
Butylbenzylphthalate	3.01E+04	Friday 1998	Mean of target and intervention values; Value for total phthalates
Caprolactam	No Screening Value		
Carbazole	No Screening Value		
Chrysene	1.00E+02	Friday 1998	Value for benzo(a)pyrene
Di-n-butylphthalate	2.00E+05	Efroymson et al. 1997	
Di-n-octylphthalate	3.01E+04	MHSPE 1994	Mean of target and intervention values; Value for total phthalates
Dibenz(a,h)anthracene	1.00E+02	Friday 1998	Value for benzo(a)pyrene
Dibenzofuran	No Screening Value		
Diethylphthalate	1.00E+02	Friday 1998	
Dimethylphthalate	2.00E+02	Friday 1998	
Fluoranthene	1.00E+02	Friday 1998	
Fluorene	1.00E+02	Friday 1998	Value for benzo(a)pyrene

TABLE 3-1
Surface Soil Screening Values - Step 2
Quanta Resources Site, New Jersey

Chemical	Screening Value	Reference	Comments
Hexachlorobenzene	2.50E+00	Friday 1998	
Hexachlorobutadiene	No Screening Value		
Hexachlorocyclopentadiene	1.00E+04	Efroymson et al. 1997	
Hexachloroethane	No Screening Value		
Indeno(1,2,3-cd)pyrene	1.00E+02	Friday 1998	Value for benzo(a)pyrene
Isophorone	No Screening Value		
N-Nitroso-di-n-propylamine	No Screening Value		
N-Nitrosodiphenylamine	2.00E+04	Friday 1998	
Naphthalene	1.00E+02	Friday 1998	
Nitrobenzene	4.00E+04	Friday 1998	
Pentachlorophenol	3.00E+03	Efroymson et al. 1997	
Phenanthrene	1.00E+02	Friday 1998	
Phenol	3.00E+04	Efroymson et al. 1997	
Pyrene	3.00E+05	Efroymson et al. 1997	
Total PAHs	4.10E+03	MHSPE 1994	Mean of target and intervention values for 10 PAHs based on the minimum TOC of 2% for organic chemicals.
VOCs (ug/kg)			
1,1,1-Trichloroethane	No Screening Value		
1,1,2,2-Tetrachloroethane	No Screening Value		
1,1,2-Trichloroethane	No Screening Value		
1,1,2-Trichlorotrifluoroethane	No Screening Value		
1,1-Dichloroethane	4.00E+02	Friday 1998	1,2-Dichloroethane value used
1,1-Dichloroethene	No Screening Value		
1,2-Dibromo-3-Chloropropane	No Screening Value		
1,2-Dibromoethane	No Screening Value		
1,2-Dichloroethane	4.00E+02	Friday 1998	
1,2-Dichloropropane	No Screening Value		
2-Butanone	No Screening Value		
2-Hexanone	No Screening Value		
4-Methyl-2-Pentanone	No Screening Value		
Acetone	No Screening Value		
Benzene	1.05E+02	MHSPE 1994	Mean of target and intervention values
Bromodichloromethane	No Screening Value		
Bromoform	No Screening Value		
Bromomethane	No Screening Value		
Carbon Disulfide	No Screening Value		
Carbon Tetrachloride	1.00E+03	Efroymson et al. 1997	
Chlorobenzene	4.00E+04	Efroymson et al. 1997	
Chlorodibromomethane	No Screening Value		
Chloroethane	No Screening Value		
Chloroform	1.00E+03	MHSPE 1994	Mean of target and intervention values
Chloromethane	No Screening Value		
cis-1,2-Dichloroethene	No Screening Value		
cis-1,3-Dichloropropene	No Screening Value		
Cyclohexane	No Screening Value		
Dichlorodifluoromethane	No Screening Value		
Ethylbenzene	5.01E+03	MHSPE 1994	Mean of target and intervention values
Isopropylbenzene	No Screening Value		
Methyl Acetate	No Screening Value		
Methyl tert-butyl Ether	No Screening Value		
Methylcyclohexane	No Screening Value		

TABLE 3-1
Surface Soil Screening Values - Step 2
Quanta Resources Site, New Jersey

Chemical	Screening Value	Reference	Comments
Methylene Chloride	2.00E+03	Friday 1998	
Styrene	3.00E+05	Efroymson et al. 1997	
Tetrachloroethene	4.01E+02	MHSPE 1994	Mean of target and intervention values
Toluene	1.30E+04	MHSPE 1994	Mean of target and intervention values
trans-1,2-Dichloroethene	No Screening Value		
trans-1,3-Dichloropropene	No Screening Value		
Trichloroethene	6.00E+03	MHSPE 1994	Mean of target and intervention values
Trichlorofluoromethane	No Screening Value		
Vinyl Chloride	1.00E+01	Friday 1998	
Xylene (Total)	2.51E+03	MHSPE 1994	Mean of target and intervention values

TABLE 3-2
Ingestion Screening Values for Mammals - Step 2
Quanta Resources Site, New Jersey

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference	Mouse	Shrew	Vole	Raccoon	Weasel
Inorganics													
Arsenic	mouse	3.00E-02	3 generations	oral in water	reproduction	1.26E+00	1.26E-01	Sample et al. 1996	X	X	X		
Arsenic	dog	1.00E+01	2 years	oral in diet	systemic	1.20E+01	1.20E+00	ATSDR 1993a				X	X
Chromium	rat	3.50E-01	3 months	oral in water	mortality	1.31E+02	1.31E+01	Sample et al. 1996	X	X	X	X	X
Lead	rat	3.50E-01	3 generations	oral in diet	reproduction	8.00E+01	8.00E+00	Sample et al. 1996	X	X	X	X	X
Pesticides/PCBs													
4,4'-DDD	rat	3.50E-01	2 years	oral in diet	reproduction	4.00E+00	8.00E-01	Sample et al. 1996	X	X	X		
4,4'-DDD	dog	1.00E+01	2 generations	oral in diet	reproduction	5.00E+00	1.00E+00	ATSDR 1994a				X	X
4,4'-DDE	rat	3.50E-01	2 years	oral in diet	reproduction	4.00E+00	8.00E-01	Sample et al. 1996	X	X	X		
4,4'-DDE	dog	1.00E+01	2 generations	oral in diet	reproduction	5.00E+00	1.00E+00	ATSDR 1994a				X	X
4,4'-DDT	rat	3.50E-01	2 years	oral in diet	reproduction	4.00E+00	8.00E-01	Sample et al. 1996	X	X	X		
4,4'-DDT	dog	1.00E+01	2 generations	oral in diet	reproduction	5.00E+00	1.00E+00	ATSDR 1994a				X	X
Aldrin	rat	3.50E-01	3 generations	oral in diet	reproduction	1.00E+00	2.00E-01	Sample et al. 1996	X	X	X	X	X
alpha-BHC	rat	3.50E-01	4 generations	oral in diet	reproduction	3.20E+00	1.60E+00	Sample et al. 1996	X	X	X	X	X
alpha-Chlordane	mouse	3.00E-02	6 generations	oral in diet	reproduction	9.16E+00	4.58E+00	Sample et al. 1996	X	X	X	X	X
Aroclor-1016	oldfield mouse	1.40E-02	12 months	oral in diet	reproduction	6.80E-01	6.80E-02	Sample et al. 1996	X	X	X		
Aroclor-1016	mink	1.00E+00	18 months	oral in diet	reproduction	3.43E+00	1.37E+00	Sample et al. 1996				X	X
Aroclor-1221	oldfield mouse	1.40E-02	12 months	oral in diet	reproduction	6.80E-01	6.80E-02	Sample et al. 1996	X	X	X		
Aroclor-1221	mink	1.00E+00	7 months	oral in diet	reproduction	6.90E-01	6.90E-02	Sample et al. 1996				X	X
Aroclor-1232	oldfield mouse	1.40E-02	12 months	oral in diet	reproduction	6.80E-01	6.80E-02	Sample et al. 1996	X	X	X		
Aroclor-1232	mink	1.00E+00	7 months	oral in diet	reproduction	6.90E-01	6.90E-02	Sample et al. 1996				X	X
Aroclor-1242	oldfield mouse	1.40E-02	12 months	oral in diet	reproduction	6.80E-01	6.80E-02	Sample et al. 1996	X	X	X		
Aroclor-1242	mink	1.00E+00	7 months	oral in diet	reproduction	6.90E-01	6.90E-02	Sample et al. 1996				X	X
Aroclor-1248	oldfield mouse	1.40E-02	12 months	oral in diet	reproduction	6.80E-01	6.80E-02	Sample et al. 1996	X	X	X		
Aroclor-1248	mink	1.00E+00	4.5 months	oral in diet	reproduction	6.90E-01	1.40E-01	Sample et al. 1996				X	X
Aroclor-1254	oldfield mouse	1.40E-02	12 months	oral in diet	reproduction	6.80E-01	6.80E-02	Sample et al. 1996	X	X	X		
Aroclor-1254	mink	1.00E+00	4.5 months	oral in diet	reproduction	6.90E-01	1.40E-01	Sample et al. 1996				X	X
Aroclor-1260	oldfield mouse	1.40E-02	12 months	oral in diet	reproduction	6.80E-01	6.80E-02	Sample et al. 1996	X	X	X		
Aroclor-1260	mink	1.00E+00	4.5 months	oral in diet	reproduction	6.90E-01	1.40E-01	Sample et al. 1996				X	X
beta-BHC	rat	3.50E-01	4 generations	oral in diet	reproduction	3.20E+00	1.60E+00	Sample et al. 1996	X	X	X	X	X
beta-Chlordane	mouse	3.00E-02	6 generations	oral in diet	reproduction	9.16E+00	4.58E+00	Sample et al. 1996	X	X	X	X	X
delta-BHC	rat	3.50E-01	4 generations	oral in diet	reproduction	3.20E+00	1.60E+00	Sample et al. 1996	X	X	X	X	X
Dieldrin	rat	3.50E-01	3 generations	oral in diet	reproduction	2.00E-01	2.00E-02	Sample et al. 1996	X	X	X	X	X
Dieldrin	dog	1.00E+01	15.7 months	oral in diet	systemic	1.40E-01	1.40E-02	ATSDR 1993b	X	X	X	X	X
Endosulfan I	rat	3.50E-01	30 days	oral (gavage)	fertility	1.50E+01	1.50E+00	Sample et al. 1996	X	X	X		
Endosulfan I	dog	1.00E+01	2 years	oral in diet	systemic	1.00E+01	1.00E+00	ATSDR 1993c				X	X
Endosulfan II	rat	3.50E-01	30 days	oral (gavage)	fertility	1.50E+01	1.50E+00	Sample et al. 1996	X	X	X		
Endosulfan II	dog	1.00E+01	2 years	oral in diet	systemic	1.00E+01	1.00E+00	ATSDR 1993c				X	X
Endrin	mouse	3.00E-02	120 days	oral in diet	reproduction	9.20E-01	9.20E-02	Sample et al. 1996	X	X	X	X	X
gamma-BHC (Lindane)	rat	3.50E-01	3 generations	oral in diet	reproduction	8.00E+01	8.00E+00	Sample et al. 1996	X	X	X	X	X
Heptachlor	mouse	3.00E-02	70 days	oral in diet	reproduction	6.50E-01	6.50E-02	ATSDR 1993d	X	X	X		
Heptachlor	mink	1.00E+00	181 days	oral in diet	reproduction	1.00E+00	1.00E-01	Sample et al. 1996				X	X
Heptachlor epoxide	mouse	3.00E-02	70 days	oral in diet	reproduction	6.50E-01	6.50E-02	ATSDR 1993d	X	X	X		
Heptachlor epoxide	mink	1.00E+00	181 days	oral in diet	reproduction	1.00E+00	1.00E-01	Sample et al. 1996				X	X
Methoxychlor	rat	3.50E-01	11 months	oral in diet	reproduction	8.00E+00	4.00E+00	Sample et al. 1996	X	X	X	X	X
Toxaphene	rat	3.50E-01	3 generations	oral in diet	reproduction	8.00E+01	8.00E+00	Sample et al. 1996	X	X	X	X	X

TABLE 3-2
Ingestion Screening Values for Mammals - Step 2
Quanta Resources Site, New Jersey

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference	Mouse	Shrew	Vole	Raccoon	Weasel
SVOCs													
1,2,4-Trichlorobenzene	rat	3.50E-01	3 generations	oral in water	reproduction	1.06E+02	5.30E+01	Coulston and Kolbye 1994	X	X	X	X	X
1,2-Dichlorobenzene	rat	3.50E-01	chronic	oral (gavage)	liver/kidney	8.57E+02	8.57E+01	Coulston and Kolbye 1994	X	X	X	X	X
1,3-Dichlorobenzene	rat	3.50E-01	chronic	oral (gavage)	liver/kidney	8.57E+02	8.57E+01	Coulston and Kolbye 1994	X	X	X	X	X
1,4-Dichlorobenzene	rat	3.50E-01	GD 6-15	oral (gavage)	developmental	5.00E+02	2.50E+02	ATSDR 1998	X	X	X	X	X
4-Bromophenyl-phenylether	No Screening Value								X	X	X	X	X
4-Chlorophenyl-phenylether	No Screening Value								X	X	X	X	X
Acenaphthene	mouse	3.00E-02	13 weeks	oral (gavage)	reproduction	7.00E+02	3.50E+02	ATSDR 1995	X	X	X	X	X
Acenaphthylene	mouse	3.00E-02	13 weeks	oral (gavage)	reproduction	7.00E+02	3.50E+02	ATSDR 1995	X	X	X	X	X
Anthracene	mouse	3.00E-02	13 weeks	oral (gavage)	reproduction	1.00E+04	1.00E+03	ATSDR 1995	X	X	X	X	X
Benzo(a)anthracene	mouse	3.00E-02	GD 7-16	oral (gavage)	reproduction	1.00E+01	1.00E+00	Sample et al. 1996	X	X	X	X	X
Benzo(a)pyrene	mouse	3.00E-02	GD 7-16	oral (gavage)	reproduction	1.00E+01	1.00E+00	Sample et al. 1996	X	X	X	X	X
Benzo(b)fluoranthene	mouse	3.00E-02	GD 7-16	oral (gavage)	reproduction	1.00E+01	1.00E+00	Sample et al. 1996	X	X	X	X	X
Benzo(g,h,i)perylene	mouse	3.00E-02	GD 7-16	oral (gavage)	reproduction	1.00E+01	1.00E+00	Sample et al. 1996	X	X	X	X	X
Benzo(k)fluoranthene	mouse	3.00E-02	GD 7-16	oral (gavage)	reproduction	1.00E+01	1.00E+00	Sample et al. 1996	X	X	X	X	X
Chrysene	mouse	3.00E-02	GD 7-16	oral (gavage)	reproduction	1.00E+01	1.00E+00	Sample et al. 1996	X	X	X	X	X
Dibenz(a,h)anthracene	mouse	3.00E-02	GD 7-16	oral (gavage)	reproduction	1.00E+01	1.00E+00	Sample et al. 1996	X	X	X	X	X
Fluoranthene	mouse	3.00E-02	13 weeks	oral (gavage)	reproduction	5.00E+03	5.00E+02	ATSDR 1995	X	X	X	X	X
Fluorene	mouse	3.00E-02	13 weeks	oral (gavage)	reproduction	5.00E+03	5.00E+02	ATSDR 1995	X	X	X	X	X
Hexachlorobenzene	rat	3.50E-01	4 generations	oral in diet	reproduction	2.00E+00	1.00E+00	ATSDR 1996a	X	X	X		
Hexachlorobenzene	dog	1.00E+01	1 year	oral	systemic	1.20E+01	1.20E+00	ATSDR 1996a				X	X
Hexachlorobutadiene	rat	3.50E-01	GD 1-22; LD 1-21	oral in diet	developmental	2.00E+01	2.00E+00	ATSDR 1994b	X	X	X	X	X
Hexachlorocyclopentadiene	mouse	3.00E-02	GD 6-15	oral (gavage)	developmental	7.50E+02	7.50E+01	ATSDR 1999a	X	X	X	X	X
Hexachloroethane	rat	3.50E-01	GD 6-16	oral (gavage)	reproduction	5.00E+02	1.00E+02	ATSDR 1997	X	X	X	X	X
Indeno(1,2,3-cd)pyrene	mouse	3.00E-02	GD 7-16	oral (gavage)	reproduction	1.00E+01	1.00E+00	Sample et al. 1996	X	X	X	X	X
Pentachlorophenol	rat	3.50E-01	2 generations	oral in diet	developmental	2.50E+01	2.50E+00	ATSDR 1994c	X	X	X	X	X
Phenanthrene	mouse	3.00E-02	13 weeks	oral (gavage)	reproduction	5.00E+03	5.00E+02	ATSDR 1995	X	X	X	X	X
Pyrene	mouse	3.00E-02	GD 7-16	oral (gavage)	reproduction	1.00E+01	1.00E+00	Sample et al. 1996	X	X	X	X	X
Total PAHs	mouse	3.00E-02	GD 7-16	oral (gavage)	reproduction	1.00E+01	1.00E+00	Sample et al. 1996	X	X	X	X	X
VOCs													
1,1,2,2-Tetrachloroethane	rat	3.50E-01	78 weeks	oral (gavage)	reproduction	7.60E+02	7.60E+01	ATSDR 1996b	X	X	X	X	X

GD = Gestation Days
LD = Lactation Days
LOAEL = Lowest Observed Adverse Effect Level
NOAEL = No Observed Adverse Effect Level

TABLE 3-3
Ingestion Screening Values for Birds - Step 2
Quanta Resources Site, New Jersey

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference	Robin	Hawk
Inorganics										
Arsenic	brown-headed cowbird	4.90E-02	7 months	oral in diet	survival	7.38E+00	2.46E+00	Sample et al. 1996	X	X
Chromium	American black duck	1.25E+00	10 months	oral in diet	reproduction	5.00E+00	1.00E+00	Sample et al. 1996	X	X
Lead	American kestrel	1.30E-01	7 months	oral in diet	reproduction	3.85E+01	3.85E+00	Sample et al. 1996	X	X
Pesticides/PCBs										
4,4'-DDD	Japanese quail	1.10E-01	3 generations	oral in diet	reproduction	5.00E+00	5.00E-01	USEPA 1995b	X	
4,4'-DDD	barn owl	4.70E-01	2 years	oral in diet	reproduction	8.00E-01	8.00E-02	Blus 1996		X
4,4'-DDE	Japanese quail	1.10E-01	3 generations	oral in diet	reproduction	5.00E+00	5.00E-01	USEPA 1995b	X	
4,4'-DDE	barn owl	4.70E-01	2 years	oral in diet	reproduction	8.00E-01	8.00E-02	Blus 1996		X
4,4'-DDT	Japanese quail	1.10E-01	3 generations	oral in diet	reproduction	5.00E+00	5.00E-01	USEPA 1995b	X	
4,4'-DDT	barn owl	4.70E-01	2 years	oral in diet	reproduction	8.00E-01	8.00E-02	Blus 1996	X	X
Aldrin	ring-necked pheasant	1.14E+00	5 days	oral in diet	survival	7.01E-01	7.01E-02	Hill et al. 1975	X	X
alpha-BHC	Japanese quail	1.50E-01	90 days	oral in diet	reproduction	2.25E+00	5.60E-01	Sample et al. 1996	X	X
alpha-Chlordane	red-winged blackbird	6.40E-02	84 days	oral in diet	survival	1.07E+01	2.14E+00	Sample et al. 1996	X	X
Aroclor-1016	screech owl	1.81E-01	2 generations	oral in diet	reproduction	4.10E+00	4.10E-01	Sample et al. 1996	X	X
Aroclor-1221	screech owl	1.81E-01	2 generations	oral in diet	reproduction	4.10E+00	4.10E-01	Sample et al. 1996	X	X
Aroclor-1232	screech owl	1.81E-01	2 generations	oral in diet	reproduction	4.10E+00	4.10E-01	Sample et al. 1996	X	X
Aroclor-1242	screech owl	1.81E-01	2 generations	oral in diet	reproduction	4.10E+00	4.10E-01	Sample et al. 1996	X	X
Aroclor-1248	screech owl	1.81E-01	2 generations	oral in diet	reproduction	4.10E+00	4.10E-01	Sample et al. 1996	X	X
Aroclor-1254	screech owl	1.81E-01	2 generations	oral in diet	reproduction	4.10E+00	4.10E-01	Sample et al. 1996	X	X
Aroclor-1260	screech owl	1.81E-01	2 generations	oral in diet	reproduction	4.10E+00	4.10E-01	Sample et al. 1996	X	X
beta-BHC	Japanese quail	1.50E-01	90 days	oral in diet	reproduction	2.25E+00	5.60E-01	Sample et al. 1996	X	X
beta-Chlordane	red-winged blackbird	6.40E-02	84 days	oral in diet	survival	1.07E+01	2.14E+00	Sample et al. 1996	X	X
delta-BHC	Japanese quail	1.50E-01	90 days	oral in diet	reproduction	2.25E+00	5.60E-01	Sample et al. 1996	X	X
Dieldrin	barn owl	4.66E-01	2 years	oral in diet	reproduction	7.70E-01	7.70E-02	Sample et al. 1996	X	X
Endosulfan I	gray partridge	4.00E-01	4 weeks	oral in diet	reproduction	1.00E+02	1.00E+01	Sample et al. 1996	X	X
Endosulfan II	gray partridge	4.00E-01	4 weeks	oral in diet	reproduction	1.00E+02	1.00E+01	Sample et al. 1996	X	X
Endrin	screech owl	1.81E-01	>83 days	oral in diet	reproduction	1.00E-01	1.00E-02	Sample et al. 1996	X	X
gamma-BHC (Lindane)	mallard	1.00E+00	8 weeks	oral (gavage)	reproduction	2.00E+01	2.00E+00	Sample et al. 1996	X	X
Heptachlor	ring-necked pheasant	1.14E+00	5 days	oral in diet	survival	2.75E+00	2.75E-01	Hill et al. 1975	X	X
Heptachlor epoxide	ring-necked pheasant	1.14E+00	5 days	oral in diet	survival	2.75E+00	2.75E-01	Hill et al. 1975	X	X
Methoxychlor	chicken	1.50E+00	16 weeks	oral in diet	reproduction	3.55E+03	3.55E+02	Wiemeyer 1996	X	X
Toxaphene	American black duck	1.00E+00	2 seasons	oral in diet	reproduction	5.00E+00	1.00E+00	Wiemeyer 1996	X	X

TABLE 3-3
Ingestion Screening Values for Birds - Step 2
Quanta Resources Site, New Jersey

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference	Robin	Hawk
SVOCs										
1,2,4-Trichlorobenzene	northern bobwhite	1.90E-01	14 days	oral	survival	1.61E+02	1.61E+01	TERRETOX 2002	X	X
1,2-Dichlorobenzene	northern bobwhite	1.90E-01	14 days	oral	survival	1.61E+02	1.61E+01	TERRETOX 2002	X	X
1,3-Dichlorobenzene	northern bobwhite	1.90E-01	14 days	oral	survival	1.61E+02	1.61E+01	TERRETOX 2002	X	X
1,4-Dichlorobenzene	northern bobwhite	1.90E-01	14 days	oral	survival	1.61E+02	1.61E+01	TERRETOX 2002	X	X
4-Bromophenyl-phenylether	No Screening Value								X	X
4-Chlorophenyl-phenylether	No Screening Value								X	X
Acenaphthene	chicken	1.50E+00	35 days	oral in diet	reproduction	7.10E+01	7.10E+00	Rigdon and Neal 1963	X	X
Acenaphthylene	chicken	1.50E+00	35 days	oral in diet	reproduction	7.10E+01	7.10E+00	Rigdon and Neal 1963	X	X
Anthracene	chicken	1.50E+00	35 days	oral in diet	reproduction	7.10E+01	7.10E+00	Rigdon and Neal 1963	X	X
Benzo(a)anthracene	chicken	1.50E+00	35 days	oral in diet	reproduction	7.10E+01	7.10E+00	Rigdon and Neal 1963	X	X
Benzo(a)pyrene	chicken	1.50E+00	35 days	oral in diet	reproduction	7.10E+01	7.10E+00	Rigdon and Neal 1963	X	X
Benzo(b)fluoranthene	chicken	1.50E+00	35 days	oral in diet	reproduction	7.10E+01	7.10E+00	Rigdon and Neal 1963	X	X
Benzo(g,h,i)perylene	chicken	1.50E+00	35 days	oral in diet	reproduction	7.10E+01	7.10E+00	Rigdon and Neal 1963	X	X
Benzo(k)fluoranthene	chicken	1.50E+00	35 days	oral in diet	reproduction	7.10E+01	7.10E+00	Rigdon and Neal 1963	X	X
Chrysene	chicken	1.50E+00	35 days	oral in diet	reproduction	7.10E+01	7.10E+00	Rigdon and Neal 1963	X	X
Dibenz(a,h)anthracene	chicken	1.50E+00	35 days	oral in diet	reproduction	7.10E+01	7.10E+00	Rigdon and Neal 1963	X	X
Fluoranthene	chicken	1.50E+00	35 days	oral in diet	reproduction	7.10E+01	7.10E+00	Rigdon and Neal 1963	X	X
Fluorene	chicken	1.50E+00	35 days	oral in diet	reproduction	7.10E+01	7.10E+00	Rigdon and Neal 1963	X	X
Hexachlorobenzene	Japanese quail	1.50E-01	90 days	oral in diet	reproduction	5.65E-01	1.13E-01	Coulston and Kolbye 1994; TERRETOX 2002	X	X
Hexachlorobutadiene	Japanese quail	1.50E-01	90 days	oral in diet	reproduction	3.39E+01	3.39E+00	Coulston and Kolbye 1994; TERRETOX 2002	X	X
Hexachlorocyclopentadiene	--	--	--	--	--	NA	NA	--	X	X
Hexachloroethane	--	--	--	--	--	NA	NA	--	X	X
Indeno(1,2,3-cd)pyrene	chicken	1.50E+00	35 days	oral in diet	reproduction	7.10E+01	7.10E+00	Rigdon and Neal 1963	X	X
Pentachlorophenol	chicken	1.50E+00	8 weeks	oral in diet	systemic/growth	8.52E+00	4.26E+00	Eisler 1989	X	X
Phenanthrene	chicken	1.50E+00	35 days	oral in diet	reproduction	7.10E+01	7.10E+00	Rigdon and Neal 1963	X	X
Pyrene	chicken	1.50E+00	35 days	oral in diet	reproduction	7.10E+01	7.10E+00	Rigdon and Neal 1963	X	X
Total PAHs	chicken	1.50E+00	35 days	oral in diet	reproduction	7.10E+01	7.10E+00	Rigdon and Neal 1963	X	X
VOCs										
1,1,2,2-Tetrachloroethane	No Screening Value								X	X

LOAEL = Lowest Observed Adverse Effect Level
NOAEL = No Observed Adverse Effect Level

TABLE 4-1
Soil Bioconcentration Factors - Step 2
Quanta Resources Site, New Jersey

Chemical	K_{ow}		Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)		Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference	Value	Reference	Value	Reference	Value	Reference
Inorganics												
Arsenic	--	--	1.10E+00	90th Percentile; Bechtel Jacobs 1998	5.23E-01	90th Percentile; Sample et al. 1998a	1.40E-02	90th Percentile; Sample et al. 1998b	1.60E-02	90th Percentile; Sample et al. 1998b	1.49E-02	90th Percentile; Sample et al. 1998b
Chromium	--	--	8.39E-02	90th Percentile; Bechtel Jacobs 1998	3.16E+00	90th Percentile; Sample et al. 1998a	3.49E-01	90th Percentile; Sample et al. 1998b	3.09E-01	90th Percentile; Sample et al. 1998b	3.33E-01	90th Percentile; Sample et al. 1998b
Lead	--	--	4.68E-01	90th Percentile; Bechtel Jacobs 1998	1.52E+00	90th Percentile; Sample et al. 1998a	2.86E-01	90th Percentile; Sample et al. 1998b	1.87E-01	90th Percentile; Sample et al. 1998b	3.39E-01	90th Percentile; Sample et al. 1998b
Pesticides/PCBs												
4,4'-DDD	6.10E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	2.00E+00	Not specified; Menzie et al. 1992	--	see text	--	see text	--	see text
4,4'-DDE	6.76E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.06E+01	Not specified; Menzie et al. 1992	--	see text	--	see text	--	see text
4,4'-DDT	6.53E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	7.00E-01	Not specified; Menzie et al. 1992	--	see text	--	see text	--	see text
Aldrin	6.50E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	3.30E+00	Not specified; Edwards and Bohlen 1992	--	see text	--	see text	--	see text
alpha-BHC	3.80E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.00E+00	Assumed	--	see text	--	see text	--	see text
alpha-Chlordane	6.32E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	4.00E+00	Not specified; Edwards and Bohlen 1992	--	see text	--	see text	--	see text
Aroclor-1016	5.60E+00	Sample et al. 1996	Regression Equation Based on K_{ow}	USEPA 2005c	1.59E+01	90th Percentile; Sample et al. 1998a	--	see text	--	see text	--	see text
Aroclor-1221	4.70E+00	Jones et al. 1997	Regression Equation Based on K_{ow}	USEPA 2005c	1.59E+01	90th Percentile; Sample et al. 1998a	--	see text	--	see text	--	see text
Aroclor-1232	5.10E+00	Jones et al. 1997	Regression Equation Based on K_{ow}	USEPA 2005c	1.59E+01	90th Percentile; Sample et al. 1998a	--	see text	--	see text	--	see text
Aroclor-1242	5.60E+00	Jones et al. 1997	Regression Equation Based on K_{ow}	USEPA 2005c	1.59E+01	90th Percentile; Sample et al. 1998a	--	see text	--	see text	--	see text
Aroclor-1248	6.20E+00	Jones et al. 1997	Regression Equation Based on K_{ow}	USEPA 2005c	1.59E+01	90th Percentile; Sample et al. 1998a	--	see text	--	see text	--	see text
Aroclor-1254	6.50E+00	Jones et al. 1997	Regression Equation Based on K_{ow}	USEPA 2005c	1.59E+01	90th Percentile; Sample et al. 1998a	--	see text	--	see text	--	see text
Aroclor-1260	6.80E+00	Jones et al. 1997	Regression Equation Based on K_{ow}	USEPA 2005c	1.59E+01	90th Percentile; Sample et al. 1998a	--	see text	--	see text	--	see text
beta-BHC	3.81E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.00E+00	Assumed	--	see text	--	see text	--	see text
beta-Chlordane	6.32E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	4.00E+00	Not specified; Edwards and Bohlen 1992	--	see text	--	see text	--	see text
delta-BHC	4.10E+00	USEPA 1996	Regression Equation Based on K_{ow}	USEPA 2005c	1.00E+00	Assumed	--	see text	--	see text	--	see text
Dieldrin	5.37E+00	USEPA 1995a	4.10E-01	Median; USEPA 2005c	8.00E+00	Geometric mean; Beyer and Gish 1980	--	see text	--	see text	--	see text
Endosulfan I	3.83E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.00E+00	Assumed	--	see text	--	see text	--	see text
Endosulfan II	4.52E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.00E+00	Assumed	--	see text	--	see text	--	see text

TABLE 4-1
Soil Bioconcentration Factors - Step 2
Quanta Resources Site, New Jersey

Chemical	K_{ow}		Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)		Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference	Value	Reference	Value	Reference	Value	Reference
Endrin	5.06E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	3.60E+00	Not specified; Edwards and Bohlen 1992	--	see text	--	see text	--	see text
gamma-BHC (Lindane)	3.73E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.00E+00	--	--	see text	--	see text	--	see text
Heptachlor	6.26E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	3.00E+00	Not specified; Edwards and Bohlen 1992	--	see text	--	see text	--	see text
Heptachlor epoxide	5.00E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	8.39E+00	Single value; USEPA 1999	--	see text	--	see text	--	see text
Methoxychlor	5.08E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.00E+00	Assumed	--	see text	--	see text	--	see text
Toxaphene	5.50E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.00E+00	Assumed	--	see text	--	see text	--	see text
SVOCs												
1,2,4-Trichlorobenzene	4.01E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	5.60E-01	Mean; Beyer 1996	--	see text	--	see text	--	see text
1,2-Dichlorobenzene	3.43E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.00E+00	Assumed	--	see text	--	see text	--	see text
1,3-Dichlorobenzene	3.50E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.00E+00	Assumed	--	see text	--	see text	--	see text
1,4-Dichlorobenzene	3.42E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.00E+00	Assumed	--	see text	--	see text	--	see text
4-Bromophenyl-phenylether	5.00E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.00E+00	Assumed	--	see text	--	see text	--	see text
4-Chlorophenyl-phenylether	4.95E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.00E+00	Assumed	--	see text	--	see text	--	see text
Acenaphthene	--	--	Regression Equation	USEPA 2005c	3.00E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Acenaphthylene	--	--	Regression Equation	USEPA 2005c	2.20E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Anthracene	--	--	Regression Equation	USEPA 2005c	3.20E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Benzo(a)anthracene	--	--	Regression Equation	USEPA 2005c	2.70E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Benzo(a)pyrene	--	--	Regression Equation	USEPA 2005c	3.40E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Benzo(b)fluoranthene	--	--	3.10E-01	Median; USEPA 2005c	2.10E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Benzo(g,h,i)perylene	--	--	6.09E-03	Median; USEPA 2005c	1.50E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Benzo(k)fluoranthene	--	--	Regression Equation	USEPA 2005c	2.10E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Chrysene	--	--	Regression Equation	USEPA 2005c	4.40E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Dibenz(a,h)anthracene	--	--	1.30E-01	Median; USEPA 2005c	4.90E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Fluoranthene	--	--	5.00E-01	Median; USEPA 2005c	3.70E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Fluorene	--	--	Regression Equation	USEPA 2005c	2.00E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Hexachlorobenzene	5.89E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.69E+00	Mean; Beyer 1996	--	see text	--	see text	--	see text
Hexachlorobutadiene	4.81E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.00E+00	Assumed	--	see text	--	see text	--	see text

TABLE 4-1
Soil Bioconcentration Factors - Step 2
Quanta Resources Site, New Jersey

Chemical	K_{ow}		Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)		Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference	Value	Reference	Value	Reference	Value	Reference
Hexachlorocyclopentadiene	5.39E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.00E+00	Assumed	--	see text	--	see text	--	see text
Hexachloroethane	4.00E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.00E+00	Assumed	--	see text	--	see text	--	see text
Indeno(1,2,3-cd)pyrene	--	--	1.10E-01	Median; USEPA 2005c	4.10E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Pentachlorophenol	5.09E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	8.00E+00	Maximum; van Gestel and Ma 1988	--	see text	--	see text	--	see text
Phenanthrene	--	--	Regression Equation	USEPA 2005c	2.80E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Pyrene	--	--	7.20E-01	Median; USEPA 2005c	3.90E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
VOCs												
1,1,2,2-Tetrachloroethane	2.39E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.00E+00	Assumed	--	see text	--	see text	--	see text

BAF = Bioaccumulation Factor
BCF = Bioconcentration Factor
K_{ow} = Octanol-water partition coefficient

TABLE 4-2
Exposure Parameters for Mammals and Birds - Step 2
Quanta Resources Site, New Jersey

Receptor	Maximum Body Weight (kg)		Minimum Body Weight (kg)		Water Ingestion Rate (L/day)	
	Value	Reference	Value	Reference	Value	Reference
Mammals						
White-footed mouse	0.0305	max for M/F - MD; Silva and Downing 1995	0.0141	min for M/F - MD; Silva and Downing 1995	0.0092	30% of max BW; Sample and Suter 1994
Short-tailed shrew	0.02131	avg max for M/F - PA; USEPA 1993	0.013	avg min for M/F - PA; USEPA 1993	0.0048	22.3% of max BW; USEPA 1993
Meadow vole	0.0635	max for M/F - VA; Silva and Downing 1995	0.030	min for M/F - VA; Silva and Downing 1995	0.0133	21% of max BW; USEPA 1993
Raccoon	7.53	max for M/F - IN; Silva and Downing 1995	4.230	min for M/F - IN; Silva and Downing 1995	0.6092	allometric equation for mammals based on max BW; USEPA 1993
Long-tailed Weasel	0.297	highest mean for M/F - NV; Brown and Lasiewski, 1972	0.15	Lowest mean for M/F - NV; Brown and Lasiewski, 1972	0.0332	allometric equation for mammals based on max BW; USEPA 1993
Birds						
American robin	0.103	max for M/F - PA; USEPA 1993	0.064	min for M/F - PA; USEPA 1993	0.0129	allometric equation for birds based on max BW; USEPA 1993
Red-tailed hawk	1.235	highest mean; USEPA 1993	0.957	minimum; USEPA 1993	0.0680	allometric equation for birds based on max BW; USEPA 1993

BW = Body Weight
F = Female
M = Male

TABLE 4-2
Exposure Parameters for Mammals and Birds - Step 2
Quanta Resources Site, New Jersey

Receptor	Food Ingestion Rate (kg/day - dry)		Dietary Composition (percent)						Soil/ Sediment Ingestion (percent)	
	Value	Reference	Terr. Plants	Soil Invert.	Mouse	Vole	Shrew	Reference	Value	Reference
Mammals										
White-footed mouse	0.0007	15.5% of max BW; Sample and Suter 1994	51	47	0	0	0	Martin et al. 1951; Sample and Suter 1994	2.0	Beyer et al. 1994
Short-tailed shrew	0.0019	55.5% of max BW; USEPA 1993	0	87	0	0	0	Assumed	13	Sample and Suter 1994
Meadow vole	0.0031	32.5% of max BW; USEPA 1993	98	0	0	0	0	Assumed	2.4	Beyer et al. 1994
Raccoon	0.1085	9.3% of max BW; Conover 1989	45	45	0	0	0	Assumed	9.4	Beyer et al. 1994; Value for sediment based on aquatic diet
Long-tailed Weasel	0.0063	Based on max mean metabolic rate (Brown and Lasiewski, 1972) and energy content of food (Golley, 1961)	0	0	32	32	32	Assumed	2.8	Beyer et al. 1994; Value is for red fox (diet assumed comparable)
Birds										
American robin	0.0074	Weighted by diet; max BW; Levey and Karasov 1989	52	44	0	0	0	Martin et al. 1951	4.6	Sample and Suter 1994
Red-tailed hawk	0.0395	10% of max BW; Sample and Suter 1994	0	0	34	33	33	Assumed	0	Sample and Suter 1994

BW = Body Weight
F = Female
M = Male

TABLE 5-1
Surface Soil Direct Exposure Screening Statistics - Step 2
Quanta Resources Site, New Jersey

Chemical	Maximum Detected Concentration	Maximum Reporting Limit	Screening Value	Hazard Quotient [1]	Retained as Step 2 COPC?
Inorganics (mg/kg)					
Arsenic	3.88E+01	NA	1.80E+01	**2.16E+00**	**Yes**
Chromium	3.79E+01	NA	4.00E-01	**9.48E+01**	**Yes**
Hexavalent Chromium	3.50E+00	NA	No Screening Value		**Yes**
Lead	4.08E+02	NA	1.20E+02	**3.40E+00**	**Yes**
Pesticides/PCBs (ug/kg)					
4,4'-DDD	2.90E+01	NA	2.00E+03	1.45E-02	No
4,4'-DDE	NA	1.80E+03	2.00E+03	9.00E-01	No
4,4'-DDT	3.50E+02	NA	2.00E+03	1.75E-01	No
Aldrin	NA	8.90E+02	2.50E+00	**3.56E+02**	**Yes**
alpha-BHC	NA	8.90E+02	2.50E+00	**3.56E+02**	**Yes**
alpha-Chlordane	NA	8.90E+02	No Screening Value		**Yes**
Aroclor-1016	NA	1.80E+04	2.51E+03	**7.17E+00**	**Yes**
Aroclor-1221	NA	1.80E+04	2.51E+03	**7.17E+00**	**Yes**
Aroclor-1232	NA	1.80E+04	2.51E+03	**7.17E+00**	**Yes**
Aroclor-1242	5.90E+02	NA	2.51E+03	2.35E-01	No
Aroclor-1248	NA	3.50E+04	2.51E+03	**1.39E+01**	**Yes**
Aroclor-1254	5.00E+02	NA	2.51E+03	1.99E-01	No
Aroclor-1260	1.10E+03	NA	2.51E+03	4.38E-01	No
beta-BHC	NA	8.90E+02	No Screening Value		**Yes**
beta-Chlordane	NA	3.20E+03	No Screening Value		**Yes**
delta-BHC	NA	8.90E+02	No Screening Value		**Yes**
Dieldrin	NA	1.80E+03	5.00E-01	**3.60E+03**	**Yes**
Endosulfan I	NA	8.90E+02	No Screening Value		**Yes**
Endosulfan II	NA	1.80E+03	No Screening Value		**Yes**
Endosulfan sulfate	NA	1.80E+03	No Screening Value		**Yes**
Endrin	NA	1.80E+03	1.00E+00	**1.80E+03**	**Yes**
Endrin aldehyde	NA	1.80E+03	No Screening Value		**Yes**
Endrin ketone	NA	1.80E+03	No Screening Value		**Yes**
gamma-BHC (Lindane)	NA	8.90E+02	No Screening Value		**Yes**
Heptachlor	NA	8.90E+02	No Screening Value		**Yes**
Heptachlor epoxide	NA	8.90E+02	No Screening Value		**Yes**
Methoxychlor	NA	8.90E+03	No Screening Value		**Yes**
Toxaphene	NA	3.50E+04	No Screening Value		**Yes**
SVOCs (ug/kg)					
1,1'-Biphenyl	1.10E+05	NA	6.00E+04	**1.83E+00**	**Yes**
1,2,4-Trichlorobenzene	NA	4.40E+03	No Screening Value		**Yes**

TABLE 5-1
Surface Soil Direct Exposure Screening Statistics - Step 2
Quanta Resources Site, New Jersey

Chemical	Maximum Detected Concentration	Maximum Reporting Limit	Screening Value	Hazard Quotient[1]	Retained as Step 2 COPC?
1,2-Dichlorobenzene	2.90E+03	NA	2.00E+04	1.45E-01	No
1,3-Dichlorobenzene	NA	4.40E+03	2.00E+04	2.20E-01	No
1,4-Dichlorobenzene	NA	4.40E+03	2.00E+04	2.20E-01	No
2,2'-oxybis(1-Chloropropane)	NA	1.90E+04	No Screening Value		**Yes**
2,4,5-Trichlorophenol	NA	1.90E+04	9.00E+03	**2.11E+00**	**Yes**
2,4,6-Trichlorophenol	NA	1.90E+04	4.00E+03	**4.75E+00**	**Yes**
2,4-Dichlorophenol	NA	1.90E+04	2.00E+04	9.50E-01	No
2,4-Dimethylphenol	6.00E+03	NA	No Screening Value		**Yes**
2,4-Dinitrophenol	NA	2.20E+05	No Screening Value		**Yes**
2,4-Dinitrotoluene	NA	1.90E+04	No Screening Value		**Yes**
2,6-Dinitrotoluene	NA	1.90E+04	No Screening Value		**Yes**
2-Chloronaphthalene	NA	1.90E+04	No Screening Value		**Yes**
2-Chlorophenol	NA	1.90E+04	1.00E+01	**1.90E+03**	**Yes**
2-Methylnaphthalene	8.40E+05	NA	No Screening Value		**Yes**
2-Methylphenol	3.70E+03	NA	No Screening Value		**Yes**
2-Nitroaniline	NA	1.90E+04	No Screening Value		**Yes**
2-Nitrophenol	NA	1.90E+04	7.00E+03	**2.71E+00**	**Yes**
3,3'-Dichlorobenzidine	NA	3.60E+04	No Screening Value		**Yes**
3-Nitroaniline	NA	1.90E+04	No Screening Value		**Yes**
4,6-Dinitro-2-methylphenol	NA	5.50E+04	No Screening Value		**Yes**
4-Bromophenyl Phenyl Ether	NA	1.90E+04	No Screening Value		**Yes**
4-Chloro-3-methylphenol	NA	1.90E+04	No Screening Value		**Yes**
4-Chloroaniline	NA	1.90E+04	No Screening Value		**Yes**
4-Chlorophenyl phenyl ether	NA	1.90E+04	No Screening Value		**Yes**
4-Methylphenol	4.00E+03	NA	No Screening Value		**Yes**
4-Nitroaniline	3.60E+03	NA	No Screening Value		**Yes**
4-Nitrophenol	NA	5.50E+04	7.00E+03	**7.86E+00**	**Yes**
Acenaphthene	2.00E+05	NA	2.00E+04	**1.00E+01**	**Yes**
Acenaphthylene	5.30E+04	NA	2.00E+04	**2.65E+00**	**Yes**
Acetophenone	2.80E+03	NA	No Screening Value		**Yes**
Anthracene	2.20E+05	NA	1.00E+02	**2.20E+03**	**Yes**
Atrazine	NA	1.90E+04	6.00E+02	**3.17E+01**	**Yes**
Benzaldehyde	NA	1.90E+04	No Screening Value		**Yes**
Benzo(a)anthracene	4.60E+05	NA	1.00E+02	**4.60E+03**	**Yes**
Benzo(a)pyrene	5.30E+05	NA	1.00E+02	**5.30E+03**	**Yes**
Benzo(b)fluoranthene	6.60E+05	NA	1.00E+02	**6.60E+03**	**Yes**
Benzo(g,h,i)perylene	3.00E+05	NA	1.00E+02	**3.00E+03**	**Yes**
Benzo(k)fluoranthene	2.40E+05	NA	1.00E+02	**2.40E+03**	**Yes**
bis(2-Chloroethoxy)methane	NA	1.90E+04	No Screening Value		**Yes**
bis(2-Chloroethyl)ether	NA	1.90E+04	No Screening Value		**Yes**

TABLE 5-1
Surface Soil Direct Exposure Screening Statistics - Step 2
Quanta Resources Site, New Jersey

Chemical	Maximum Detected Concentration	Maximum Reporting Limit	Screening Value	Hazard Quotient[1]	Retained as Step 2 COPC?
bis(2-Ethylhexyl)phthalate	2.60E+04	NA	3.01E+04	8.65E-01	No
Butylbenzylphthalate	NA	1.90E+04	3.01E+04	6.32E-01	No
Caprolactam	1.20E+03	NA	No Screening Value		**Yes**
Carbazole	1.00E+05	NA	No Screening Value		**Yes**
Chrysene	4.90E+05	NA	1.00E+02	**4.90E+03**	**Yes**
Di-n-butylphthalate	NA	1.90E+04	2.00E+05	9.50E-02	No
Di-n-octylphthalate	NA	1.90E+04	3.01E+04	6.32E-01	No
Dibenz(a,h)anthracene	1.00E+05	NA	1.00E+02	**1.00E+03**	**Yes**
Dibenzofuran	1.50E+05	NA	No Screening Value		**Yes**
Diethylphthalate	NA	1.90E+04	1.00E+02	**1.90E+02**	**Yes**
Dimethylphthalate	NA	1.90E+04	2.00E+02	**9.50E+01**	**Yes**
Fluoranthene	7.30E+05	NA	1.00E+02	**7.30E+03**	**Yes**
Fluorene	2.50E+05	NA	1.00E+02	**2.50E+03**	**Yes**
Hexachlorobenzene	NA	1.90E+04	2.50E+00	**7.60E+03**	**Yes**
Hexachlorobutadiene	NA	1.90E+04	No Screening Value		**Yes**
Hexachlorocyclopentadiene	NA	5.50E+04	1.00E+04	**5.50E+00**	**Yes**
Hexachloroethane	NA	1.90E+04	No Screening Value		**Yes**
Indeno(1,2,3-cd)pyrene	2.70E+05	NA	1.00E+02	**2.70E+03**	**Yes**
Isophorone	NA	1.90E+04	No Screening Value		**Yes**
N-Nitroso-di-n-propylamine	NA	1.90E+04	No Screening Value		**Yes**
N-Nitrosodiphenylamine	NA	1.90E+04	2.00E+04	9.50E-01	No
Naphthalene	1.80E+06	NA	1.00E+02	**1.80E+04**	**Yes**
Nitrobenzene	NA	1.90E+04	4.00E+04	4.75E-01	No
Pentachlorophenol	NA	5.50E+04	3.00E+03	**1.83E+01**	**Yes**
Phenanthrene	8.00E+05	NA	1.00E+02	**8.00E+03**	**Yes**
Phenol	2.90E+03	NA	3.00E+04	9.67E-02	No
Pyrene	7.30E+05	NA	3.00E+05	**2.43E+00**	**Yes**
Total PAHs[2]	5.84E+06	NA	4.10E+03	**1.42E+03**	**Yes**
VOCs (ug/kg)					
1,1,1-Trichloroethane	NA	4.40E+03	No Screening Value		**Yes**
1,1,2,2-Tetrachloroethane	NA	4.40E+03	No Screening Value		**Yes**
1,1,2-Trichloroethane	NA	4.40E+03	No Screening Value		**Yes**
1,1,2-Trichlorotrifluoroethane	NA	8.80E+03	No Screening Value		**Yes**
1,1-Dichloroethane	NA	4.40E+03	4.00E+02	**1.10E+01**	**Yes**
1,1-Dichloroethene	NA	4.40E+03	No Screening Value		**Yes**
1,2-Dibromo-3-Chloropropane	NA	4.40E+03	No Screening Value		**Yes**
1,2-Dibromoethane	NA	4.40E+03	No Screening Value		**Yes**
1,2-Dichloroethane	NA	4.40E+03	4.00E+02	**1.10E+01**	**Yes**
1,2-Dichloropropane	NA	4.40E+03	No Screening Value		**Yes**

TABLE 5-1
Surface Soil Direct Exposure Screening Statistics - Step 2
Quanta Resources Site, New Jersey

Chemical	Maximum Detected Concentration	Maximum Reporting Limit	Screening Value	Hazard Quotient [1]	Retained as Step 2 COPC?
2-Butanone	1.50E+01	NA	No Screening Value		**Yes**
2-Hexanone	NA	8.80E+03	No Screening Value		**Yes**
4-Methyl-2-Pentanone	NA	8.80E+03	No Screening Value		**Yes**
Acetone	1.10E+02	NA	No Screening Value		**Yes**
Benzene	2.10E+03	NA	1.05E+02	**2.00E+01**	**Yes**
Bromodichloromethane	NA	4.40E+03	No Screening Value		**Yes**
Bromoform	NA	4.40E+03	No Screening Value		**Yes**
Bromomethane	NA	4.40E+03	No Screening Value		**Yes**
Carbon Disulfide	4.00E+00	NA	No Screening Value		**Yes**
Carbon Tetrachloride	NA	4.40E+03	1.00E+03	**4.40E+00**	**Yes**
Chlorobenzene	NA	4.40E+03	4.00E+04	1.10E-01	No
Chlorodibromomethane	NA	4.40E+03	No Screening Value		**Yes**
Chloroethane	NA	3.50E+03	No Screening Value		**Yes**
Chloroform	NA	4.40E+03	1.00E+03	**4.40E+00**	**Yes**
Chloromethane	NA	4.40E+03	No Screening Value		**Yes**
cis-1,2-Dichloroethene	NA	4.40E+03	No Screening Value		**Yes**
cis-1,3-Dichloropropene	NA	4.40E+03	No Screening Value		**Yes**
Cyclohexane	3.00E+00	NA	No Screening Value		**Yes**
Dichlorodifluoromethane	NA	4.40E+03	No Screening Value		**Yes**
Ethylbenzene	5.90E+03	NA	5.01E+03	**1.18E+00**	**Yes**
Isopropylbenzene	1.30E+03	NA	No Screening Value		**Yes**
Methyl Acetate	1.10E+03	NA	No Screening Value		**Yes**
Methyl tert-butyl Ether	NA	4.40E+03	No Screening Value		**Yes**
Methylcyclohexane	6.00E+00	NA	No Screening Value		**Yes**
Methylene Chloride	NA	4.40E+03	2.00E+03	**2.20E+00**	**Yes**
Styrene	NA	4.40E+03	3.00E+05	1.47E-02	No
Tetrachloroethene	5.20E+02	NA	4.01E+02	**1.30E+00**	**Yes**
Toluene	4.30E+03	NA	1.30E+04	3.31E-01	No
trans-1,2-Dichloroethene	NA	4.40E+03	No Screening Value		**Yes**
trans-1,3-Dichloropropene	NA	4.40E+03	No Screening Value		**Yes**
Trichloroethene	NA	4.40E+03	6.00E+03	7.33E-01	No
Trichlorofluoromethane	1.20E+04	NA	No Screening Value		**Yes**
Vinyl Chloride	NA	4.40E+03	1.00E+01	**4.40E+02**	**Yes**
Xylene (Total)	2.10E+04	NA	2.51E+03	**8.38E+00**	**Yes**

[1] Hazard Quotient based on maximum detected concentration or maximum reporting limit if chemical was not detected in any sample

[2] The total PAHs concentration used for direct exposure is the sum of 10 indivdual PAHs for which the screening value (MHSPE 1994) was derived

NA = Not applicable because not detected or maximum detected concentration used

TABLE 5-2
Bird and Mammal Ingestion Screening Statistics - Step 2
Quanta Resources Site, New Jersey

Chemical	Short-tailed shrew		White-footed mouse		Meadow vole		Raccoon		Long-tailed weasel		American robin		Red-tailed hawk	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics														
Arsenic	**2.56E+01**	**2.56E+00**	**1.32E+01**	**1.32E+00**	**3.50E+01**	**3.50E+00**	6.11E-01	6.11E-02	5.68E-02	<1.00E-02	**1.55E+00**	5.16E-01	<1.00E-02	<1.00E-02
Hexavalent Chromium	4.37E-01	4.37E-02	8.58E-02	<1.00E-02	1.17E-02	<1.00E-02	4.03E-02	<1.00E-02	1.54E-02	<1.00E-02	5.94E-01	1.19E-01	4.78E-02	<1.00E-02
Lead	**1.05E+01**	**1.05E+00**	**2.58E+00**	2.58E-01	**2.53E+00**	2.53E-01	**1.18E+00**	1.18E-01	6.13E-01	6.13E-02	**1.17E+01**	**1.17E+00**	**1.19E+00**	1.19E-01
Pesticides/PCBs														
4,4'-DDD	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02
4,4'-DDE	**2.99E+00**	5.98E-01	5.84E-01	1.17E-01	<1.00E-02	<1.00E-02	2.22E-01	4.44E-02	1.22E-01	2.44E-02	**1.94E+00**	1.94E-01	**1.53E+00**	1.53E-01
4,4'-DDT	4.62E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	2.86E-02	<1.00E-02	2.43E-02	<1.00E-02
Aldrin	**1.90E+00**	3.80E-01	3.63E-01	7.27E-02	1.15E-02	<1.00E-02	1.71E-01	3.42E-02	1.00E-01	2.01E-02	**2.18E+00**	2.18E-01	2.78E-01	2.78E-02
alpha-BHC	7.91E-02	3.95E-02	1.42E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	8.88E-02	2.21E-02	1.16E-02	<1.00E-02
alpha-Chlordane	9.97E-02	4.99E-02	1.92E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	8.61E-02	1.72E-02	1.09E-02	<1.00E-02
Aroclor-1016	**5.26E+02**	**5.26E+01**	**1.03E+02**	**1.03E+01**	6.89E-01	6.89E-02	**2.43E+00**	9.71E-01	**1.32E+00**	5.29E-01	**3.55E+01**	**3.55E+00**	**4.47E+00**	4.47E-01
Aroclor-1221	**5.26E+02**	**5.26E+01**	**1.03E+02**	**1.03E+01**	6.98E-01	6.98E-02	**4.83E+01**	**4.83E+00**	**2.63E+01**	**2.63E+00**	**3.55E+01**	**3.55E+00**	**4.47E+00**	4.47E-01
Aroclor-1232	**5.26E+02**	**5.26E+01**	**1.03E+02**	**1.03E+01**	6.92E-01	6.92E-02	**4.83E+01**	**4.83E+00**	**2.63E+01**	**2.63E+00**	**3.55E+01**	**3.55E+00**	**4.47E+00**	4.47E-01
Aroclor-1242	**1.73E+01**	**1.73E+00**	**3.42E+00**	3.42E-01	5.29E-02	<1.00E-02	**1.59E+00**	1.59E-01	8.80E-01	8.80E-02	**1.16E+00**	1.16E-01	1.48E-01	1.48E-02
Aroclor-1248	**1.02E+03**	**1.02E+02**	**2.00E+02**	**2.00E+01**	**1.31E+00**	1.31E-01	**4.62E+01**	**9.38E+00**	**2.52E+01**	**5.11E+00**	**6.89E+01**	**6.89E+00**	**8.69E+00**	8.69E-01
Aroclor-1254	**1.46E+01**	**1.46E+00**	**2.91E+00**	2.91E-01	4.96E-02	<1.00E-02	6.65E-01	1.35E-01	3.69E-01	7.49E-02	9.87E-01	9.87E-02	1.26E-01	1.26E-02
Aroclor-1260	**3.22E+01**	3.22E+00	**6.34E+00**	6.34E-01	7.15E-02	<1.00E-02	**1.46E+00**	2.96E-01	8.00E-01	1.62E-01	**2.17E+00**	2.17E-01	2.75E-01	2.75E-02
beta-BHC	7.92E-02	3.96E-02	1.43E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	8.89E-02	2.21E-02	1.17E-02	<1.00E-02
beta-Chlordane	3.59E-01	1.79E-01	6.90E-02	3.45E-02	<1.00E-02	<1.00E-02	3.25E-02	1.63E-02	1.88E-02	<1.00E-02	3.10E-01	6.19E-02	3.94E-02	<1.00E-02
delta-BHC	7.91E-02	3.95E-02	1.42E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	8.87E-02	2.21E-02	1.16E-02	<1.00E-02
Dieldrin	**9.07E+01**	**9.07E+00**	**1.86E+01**	**1.86E+00**	**3.95E+00**	3.95E-01	**1.26E+01**	**1.26E+00**	**6.93E+00**	6.93E-01	**1.01E+01**	**1.01E+00**	**1.26E+00**	1.26E-01
Endosulfan I	8.44E-02	<1.00E-02	1.52E-02	<1.00E-02	<1.00E-02	<1.00E-02	1.04E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02
Endosulfan II	1.71E-01	1.71E-02	3.06E-02	<1.00E-02	<1.00E-02	<1.00E-02	2.10E-02	<1.00E-02	1.49E-02	<1.00E-02	1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02
Endrin	**9.07E+00**	9.07E-01	**1.74E+00**	1.74E-01	4.98E-02	<1.00E-02	8.19E-01	8.19E-02	4.78E-01	4.78E-02	**3.36E+01**	**3.36E+00**	**4.28E+00**	4.28E-01
gamma-BHC (Lindane)	1.53E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	2.40E-02	<1.00E-02	<1.00E-02	<1.00E-02
Heptachlor	**5.33E+00**	5.33E-01	**1.02E+00**	1.02E-01	3.46E-02	<1.00E-02	3.11E-01	3.11E-02	1.84E-01	1.84E-02	5.06E-01	5.06E-02	6.45E-02	<1.00E-02
Heptachlor epoxide	**1.45E+01**	**1.45E+00**	**2.82E+00**	2.82E-01	3.49E-02	<1.00E-02	8.68E-01	8.68E-02	4.81E-01	4.81E-02	**1.38E+00**	1.38E-01	1.75E-01	1.75E-02
Methoxychlor	3.16E-01	1.58E-01	5.68E-02	2.84E-02	<1.00E-02	<1.00E-02	2.59E-02	1.30E-02	1.85E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02
Toxaphene	6.22E-01	6.22E-02	1.12E-01	1.12E-02	1.14E-02	<1.00E-02	5.10E-02	<1.00E-02	3.65E-02	<1.00E-02	**1.95E+00**	3.91E-01	2.56E-01	5.12E-02
SVOCs														
1,2,4-Trichlorobenzene	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02
1,2-Dichlorobenzene	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	1.01E-02	<1.00E-02	<1.00E-02	<1.00E-02
1,3-Dichlorobenzene	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	1.53E-02	<1.00E-02	<1.00E-02	<1.00E-02
1,4-Dichlorobenzene	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	1.53E-02	<1.00E-02	<1.00E-02	<1.00E-02
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	3.18E-02	1.59E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	5.76E-01	5.76E-02	8.01E-02	<1.00E-02
Acenaphthylene	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	1.85E-01	1.85E-02	2.32E-02	<1.00E-02
Anthracene	1.28E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	8.75E-01	8.75E-02	1.11E-01	1.11E-02
Benzo(a)anthracene	**2.39E+01**	**2.39E+00**	**3.61E+00**	3.61E-01	**1.42E+00**	1.42E-01	**1.48E+00**	1.48E-01	**1.75E+00**	1.75E-01	**1.25E+00**	1.25E-01	1.75E-01	1.75E-02
Benzo(a)pyrene	**3.21E+01**	**3.21E+00**	**6.51E+00**	6.51E-01	**7.15E+00**	7.15E-01	**2.77E+00**	2.77E-01	**2.54E+00**	2.54E-01	**2.17E+00**	2.17E-01	2.76E-01	2.76E-02
Benzo(b)fluoranthene	**2.94E+01**	**2.94E+00**	**9.54E+00**	9.54E-01	**2.23E+01**	**2.23E+00**	**4.00E+00**	4.00E-01	**3.34E+00**	3.34E-01	**3.22E+00**	3.22E-01	3.70E-01	3.70E-02
Benzo(g,h,i)perylene	**1.11E+01**	**1.11E+00**	**1.03E+01**	**1.03E+00**	**3.46E+01**	**3.46E+00**	**4.43E+00**	4.43E-01	**2.70E+00**	2.70E-01	**3.39E+00**	3.39E-01	3.38E-01	3.38E-02
Benzo(k)fluoranthene	**1.07E+01**	**1.07E+00**	**1.84E+00**	1.84E-01	**1.90E+00**	1.90E-01	7.40E-01	7.40E-02	8.89E-01	8.89E-02	6.48E-01	6.48E-02	8.72E-02	<1.00E-02
Chrysene	**3.57E+01**	**3.57E+00**	**5.88E+00**	5.88E-01	**1.51E+00**	1.51E-01	**2.55E+00**	2.55E-01	**2.39E+00**	2.39E-01	**1.92E+00**	1.92E-01	2.61E-01	2.61E-02

TABLE 5-2
Bird and Mammal Ingestion Screening Statistics - Step 2
Quanta Resources Site, New Jersey

Chemical	Short-tailed shrew		White-footed mouse		Meadow vole		Raccoon		Long-tailed weasel		American robin		Red-tailed hawk	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Dibenz(a,h)anthracene	**7.91E+00**	7.91E-01	**1.65E+00**	1.65E-01	**1.56E+00**	1.56E-01	7.22E-01	7.22E-02	5.84E-01	5.84E-02	5.34E-01	5.34E-02	6.72E-02	<1.00E-02
Fluoranthene	9.39E-02	<1.00E-02	3.42E-02	<1.00E-02	7.72E-02	<1.00E-02	1.48E-02	<1.00E-02	1.03E-02	<1.00E-02	**5.56E+00**	5.56E-01	6.20E-01	6.20E-02
Fluorene	2.16E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	5.43E-01	5.43E-02	7.78E-02	<1.00E-02
Hexachlorobenzene	**4.32E+00**	**2.16E+00**	8.06E-01	4.03E-01	4.94E-02	2.47E-02	3.12E-01	3.12E-02	2.00E-01	2.00E-02	**1.52E+01**	**3.05E+00**	**1.96E+00**	3.93E-01
Hexachlorobutadiene	**1.35E+00**	1.35E-01	2.43E-01	2.43E-02	2.50E-02	<1.00E-02	1.11E-01	1.11E-02	7.93E-02	<1.00E-02	3.13E-01	3.13E-02	4.10E-02	<1.00E-02
Hexachlorocyclopentadiene	1.04E-01	1.04E-02	1.88E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	NA	NA	NA	NA
Hexachloroethane	2.70E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	**1.87E+01**	**1.87E+00**	**3.79E+00**	3.79E-01	**3.68E+00**	3.68E-01	**1.64E+00**	1.64E-01	**1.42E+00**	1.42E-01	**1.24E+00**	1.24E-01	1.58E-01	1.58E-02
Pentachlorophenol	**2.22E+01**	**2.22E+00**	**4.32E+00**	4.32E-01	5.74E-02	<1.00E-02	**2.05E+00**	2.05E-01	**1.14E+00**	1.14E-01	**5.28E+00**	**2.64E+00**	6.67E-01	3.34E-01
Phenanthrene	8.50E-02	<1.00E-02	1.55E-02	<1.00E-02	1.48E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	**2.65E+00**	2.65E-01	3.48E-01	3.48E-02
Pyrene	**4.87E+01**	**4.87E+00**	**2.17E+01**	**2.17E+00**	**5.48E+01**	**5.48E+00**	**9.43E+00**	9.43E-01	**6.10E+00**	6.10E-01	**7.03E+00**	7.03E-01	7.56E-01	7.56E-02
Total PAHs[1]	**3.65E+02**	**3.65E+01**	**7.30E+01**	**7.30E+00**	**7.74E+01**	**7.74E+00**	**3.11E+01**	**3.11E+00**	**2.87E+01**	**2.87E+00**	**2.43E+01**	**2.43E+00**	**3.11E+00**	3.11E-01
VOCs														
1,1,2,2-Tetrachloroethane	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	<1.00E-02	NA	NA	NA	NA

[1] The total PAHs concentrations used for ingestion exposure is the sum of indivdual PAHs considered bioaccumulative (USEPA 2000)
NA = Not applicable because no screening value was available and a hazard quotient could not be calculated

TABLE 6-1
Soil Bioconcentration Factors - COPC Refinement
Quanta Resources Site, New Jersey

Chemical	K_{ow}		Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)		Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference	Value	Reference	Value	Reference	Value	Reference
Inorganics												
Arsenic	--	--	3.71E-02	Geometric mean; Bechtel Jacobs 1998	2.58E-01	Arithmetic mean; Sample et al 1998a	3.26E-03	Geometric mean; Sample et al. 1998b	5.42E-03	Geometric mean; Sample et al. 1998b	3.87E-03	Geometric mean; Sample et al. 1998b
Chromium	--	--	4.75E-02	Geometric mean; Bechtel Jacobs 1998	3.20E-01	Geometric mean; Sample et al 1998a	9.20E-02	Geometric mean; Sample et al. 1998b	8.84E-02	Geometric mean; Sample et al. 1998b	9.39E-02	Geometric mean; Sample et al. 1998b
Zinc	--	--	3.58E-01	Geometric mean; Bechtel Jacobs 1998	2.48E+00	Geometric mean; Sample et al 1998a	5.48E-02	Geometric mean; Sample et al. 1998b	2.93E-01	Geometric mean; Sample et al. 1998b	8.62E-01	Geometric mean; Sample et al. 1998b
Pesticides/PCBs												
4,4'-DDE	6.76E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.06E+01	Not specified; Menzie et al. 1992	--	see text	--	see text	--	see text
Aldrin	6.50E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	3.30E+00	Not specified; Edwards and Bohlen 1992	--	see text	--	see text	--	see text
Aroclor-1016	5.60E+00	Sample et al. 1996	Regression Equation Based on K_{ow}	USEPA 2005c	4.30E+00	Geometric mean; Sample et al 1998a	--	see text	--	see text	--	see text
Aroclor-1221	4.70E+00	Jones et al. 1997	Regression Equation Based on K_{ow}	USEPA 2005c	4.30E+00	Geometric mean; Sample et al 1998a	--	see text	--	see text	--	see text
Aroclor-1232	5.10E+00	Jones et al. 1997	Regression Equation Based on K_{ow}	USEPA 2005c	4.30E+00	Geometric mean; Sample et al 1998a	--	see text	--	see text	--	see text
Aroclor-1242	5.60E+00	Jones et al. 1997	Regression Equation Based on K_{ow}	USEPA 2005c	4.30E+00	Geometric mean; Sample et al 1998a	--	see text	--	see text	--	see text
Aroclor-1248	6.20E+00	Jones et al. 1997	3.31E-05	USEPA 2005c	4.30E+00	Geometric mean; Sample et al 1998a	--	see text	--	see text	--	see text
Aroclor-1254	6.50E+00	Jones et al. 1997	2.01E-05	USEPA 2005c	4.30E+00	Geometric mean; Sample et al 1998a	--	see text	--	see text	--	see text
Aroclor-1260	6.80E+00	Jones et al. 1997	1.22E-05	USEPA 2005c	4.30E+00	Geometric mean; Sample et al 1998a	--	see text	--	see text	--	see text
Dieldrin	5.37E+00	USEPA 1995a	4.10E-01	Median; USEPA 2005c	8.00E+00	Geometric mean; Beyer and Gish 1980	--	see text	--	see text	--	see text
Endrin	5.06E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	3.60E+00	Not specified; Edwards and Bohlen 1992	--	see text	--	see text	--	see text
Heptachlor	6.26E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	3.00E+00	Not specified; Edwards and Bohlen 1992	--	see text	--	see text	--	see text
Heptachlor epoxide	5.00E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	8.39E+00	Single value; USEPA 1999	--	see text	--	see text	--	see text
Toxaphene	5.50E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.00E+00	Assumed	--	see text	--	see text	--	see text
SVOCs												
Benzo(a)anthracene	--	--	Regression Equation	USEPA 2005c	2.70E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Benzo(a)pyrene	--	--	Regression Equation	USEPA 2005c	3.40E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Benzo(b)fluoranthene	--	--	3.10E-01	USEPA 2005c	2.10E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Benzo(g,h,i)perylene	--	--	6.09E-03	USEPA 2005c	1.50E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Benzo(k)fluoranthene	--	--	Regression Equation	USEPA 2005c	2.10E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Chrysene	--	--	Regression Equation	USEPA 2005c	4.40E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Dibenz(a,h)anthracene	--	--	1.30E-01	USEPA 2005c	4.90E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text

TABLE 6-1
Soil Bioconcentration Factors - COPC Refinement
Quanta Resources Site, New Jersey

Chemical	K_{ow}		Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)		Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference	Value	Reference	Value	Reference	Value	Reference
Fluoranthene	--	--	5.00E-01	USEPA 2005c	3.70E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Hexachlorobenzene	5.89E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.69E+00	Mean; Beyer 1996	--	see text	--	see text	--	see text
Hexachlorobutadiene	4.81E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	1.00E+00	Assumed	--	see text	--	see text	--	see text
Indeno(1,2,3-cd)pyrene	--	--	1.10E-01	USEPA 2005c	4.10E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Pentachlorophenol	5.09E+00	USEPA 1995a	Regression Equation Based on K_{ow}	USEPA 2005c	5.18E+00	Arithmetic average; van Gestel and Ma 1988	--	see text	--	see text	--	see text
Phenanthrene	--	--	Regression Equation	USEPA 2005c	2.80E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text
Pyrene	--	--	7.20E-01	USEPA 2005c	3.90E-01	Median; Beyer and Stafford 1993	--	see text	--	see text	--	see text

BAF = Bioaccumulation Factor
BCF = Bioconcentration Factor
K_{ow} = Octanol-water partition coefficient

TABLE 6-2
Exposure Parameters for Upper Trophic Level Ecological Receptors - COPC Refinement
Quanta Resources Site, New Jersey

Receptor	Average Body Weight (kg)		Water Ingestion Rate (L/day)		Food Ingestion Rate (kg/day - dry)	
	Value	Reference	Value	Reference	Value	Reference
Mammals						
White-footed mouse	0.0208	mean for M/F - MD	0.0062	30% of mean BW; Sample and Suter 1994	0.0005	15.5% of mean BW; Sample and Suter 1994
Short-tailed shrew	0.017	avg mean for M/F - PA; USEPA 1993	0.0038	22.3% of mean BW; USEPA 1993	0.0015	55.5% of mean BW; USEPA 1993
Meadow vole	0.043	mean for M/F - MD; Silva and Downing 1995	0.0090	21% of mean BW; USEPA 1993	0.0021	32.5% of mean BW; USEPA 1993
Raccoon	5.94	mean for M/F - IN; Silva and Downing 1995	0.4921	allometric equation for mammals based on mean BW; USEPA 1993	0.0856	9.3% of mean BW; Conover 1989
Long-tailed Weasel	0.225	mean for M/F - NV; Brown and Lasiewski, 1972	0.0259	allometric equation for mammals based on mean BW; USEPA 1993	0.0051	Based on mean metabolic rate (Brown and Lasiewski, 1972) and energy content of food (Golley, 1961)
Birds						
American robin	0.077	avg for M/F - PA; USEPA 1993	0.0106	allometric equation for birds based on avg BW; USEPA 1993	0.0055	weighted by diet component; Levey and Karasov 1989
Red-tailed hawk	1.13	average; USEPA 1993	0.0639	allometric equation for birds based on avg BW; USEPA 1993	0.0360	10% of avg BW; Sample and Suter 1994

BW = Body Weight
F = Female
M = Male

TABLE 6-2
Exposure Parameters for Upper Trophic Level Ecological Receptors - COPC Refinement
Quanta Resources Site, New Jersey

Receptor	Dietary Composition (percent)						Soil Ingestion (percent)	
	Terr. Plants	Soil Invert.	Mouse	Vole	Shrew	Reference	Value	Reference
Mammals								
White-footed mouse	51	47	0	0	0	Martin et al. 1951; Sample and Suter 1994	2.0	Beyer et al. 1994
Short-tailed shrew	0	87	0	0	0	Assumed	13	Sample and Suter 1994
Meadow vole	98	0	0	0	0	Assumed	2.4	Beyer et al. 1994
Raccoon	45	45	0	0	0	Assumed	9.4	Beyer et al. 1994; Value for sediment based on aquatic diet
Long-tailed Weasel	0	0	32	32	32	Assumed	2.8	Beyer et al. 1994; Value is for red fox (diet assumed comparable)
Birds								
American robin	52	44	0	0	0	Martin et al. 1951	4.6	Sample and Suter 1994
Red-tailed hawk	0	0	34	33	33	USEPA 1993a; Sample and Suter 1994	0	Sample and Suter 1994

BW = Body Weight
F = Female
M = Male

TABLE 6-3
Surface Soil Direct Exposure Screening Statistics - COPC Refinement
Quanta Resources Site, New Jersey

Chemical	Average Concentration	Screening Value	Hazard Quotient	Hazard Quotient ≥ 1.0
Inorganics (mg/kg)				
Arsenic	1.33E+01	1.80E+01	7.40E-01	No
Chromium	2.07E+01	4.00E-01	**5.17E+01**	**Yes**
Lead	1.47E+02	1.20E+02	**1.23E+00**	**Yes**
Pesticides/PCBs (ug/kg)				
Aldrin	2.24E+02	2.50E+00	**8.97E+01**	**Yes**
alpha-BHC	2.24E+02	2.50E+00	**8.97E+01**	**Yes**
Aroclor-1016	1.47E+03	2.51E+03	5.87E-01	No
Aroclor-1221	1.43E+03	2.51E+03	5.71E-01	No
Aroclor-1232	1.45E+03	2.51E+03	5.77E-01	No
Aroclor-1248	2.78E+03	2.51E+03	**1.11E+00**	**Yes**
Dieldrin	4.61E+02	5.00E-01	**9.21E+02**	**Yes**
Endrin	4.61E+02	1.00E+00	**4.61E+02**	**Yes**
SVOCs (ug/kg)				
1,1'-Biphenyl	1.51E+04	6.00E+04	2.51E-01	No
2,4,5-Trichlorophenol	3.76E+03	9.00E+03	4.18E-01	No
2,4,6-Trichlorophenol	3.76E+03	4.00E+03	9.40E-01	No
2-Chlorophenol	3.76E+03	1.00E+01	**3.76E+02**	**Yes**
2-Nitrophenol	3.76E+03	7.00E+03	5.37E-01	No
4-Nitrophenol	1.12E+04	7.00E+03	**1.60E+00**	**Yes**
Acenaphthene	5.83E+04	2.00E+04	**2.92E+00**	**Yes**
Acenaphthylene	1.64E+04	2.00E+04	8.21E-01	No
Anthracene	9.21E+04	1.00E+02	**9.21E+02**	**Yes**
Atrazine	3.76E+03	6.00E+02	**6.27E+00**	**Yes**
Benzo(a)anthracene	1.47E+05	1.00E+02	**1.47E+03**	**Yes**
Benzo(a)pyrene	1.51E+05	1.00E+02	**1.51E+03**	**Yes**
Benzo(b)fluoranthene	1.88E+05	1.00E+02	**1.88E+03**	**Yes**
Benzo(g,h,i)perylene	8.78E+04	1.00E+02	**8.78E+02**	**Yes**
Benzo(k)fluoranthene	7.93E+04	1.00E+02	**7.93E+02**	**Yes**
Chrysene	1.55E+05	1.00E+02	**1.55E+03**	**Yes**
Dibenz(a,h)anthracene	2.70E+04	1.00E+02	**2.70E+02**	**Yes**
Diethylphthalate	3.76E+03	1.00E+02	**3.76E+01**	**Yes**
Dimethylphthalate	3.76E+03	2.00E+02	**1.88E+01**	**Yes**
Fluoranthene	3.08E+05	1.00E+02	**3.08E+03**	**Yes**
Fluorene	7.23E+04	1.00E+02	**7.23E+02**	**Yes**
Hexachlorobenzene	3.76E+03	2.50E+00	**1.50E+03**	**Yes**
Hexachlorocyclopentadiene	1.12E+04	1.00E+04	**1.12E+00**	**Yes**
Indeno(1,2,3-cd)pyrene	8.12E+04	1.00E+02	**8.12E+02**	**Yes**
Naphthalene	2.05E+05	1.00E+02	**2.05E+03**	**Yes**
Pentachlorophenol	1.12E+04	3.00E+03	**3.73E+00**	**Yes**
Phenanthrene	3.05E+05	1.00E+02	**3.05E+03**	**Yes**
Pyrene	2.71E+05	3.00E+05	9.05E-01	No
Total PAHs [1]	1.61E+06	4.10E+03	**3.93E+02**	**Yes**

TABLE 6-3
Surface Soil Direct Exposure Screening Statistics - COPC Refinement
Quanta Resources Site, New Jersey

Chemical	Average Concentration	Screening Value	Hazard Quotient	Hazard Quotient ≥ 1.0
VOCs (ug/kg)				
1,1-Dichloroethane	3.57E+02	4.00E+02	8.92E-01	No
1,2-Dichloroethane	3.57E+02	4.00E+02	8.92E-01	No
Benzene	4.80E+02	1.05E+02	**4.57E+00**	**Yes**
Carbon Tetrachloride	3.57E+02	1.00E+03	3.57E-01	No
Chloroform	3.57E+02	1.00E+03	3.57E-01	No
Ethylbenzene	6.08E+02	5.01E+03	1.22E-01	No
Methylene Chloride	3.57E+02	2.00E+03	1.78E-01	No
Tetrachloroethene	3.64E+02	4.01E+02	9.08E-01	No
Vinyl Chloride	3.57E+02	1.00E+01	**3.57E+01**	**Yes**
Xylene (Total)	3.71E+03	2.51E+03	**1.48E+00**	**Yes**

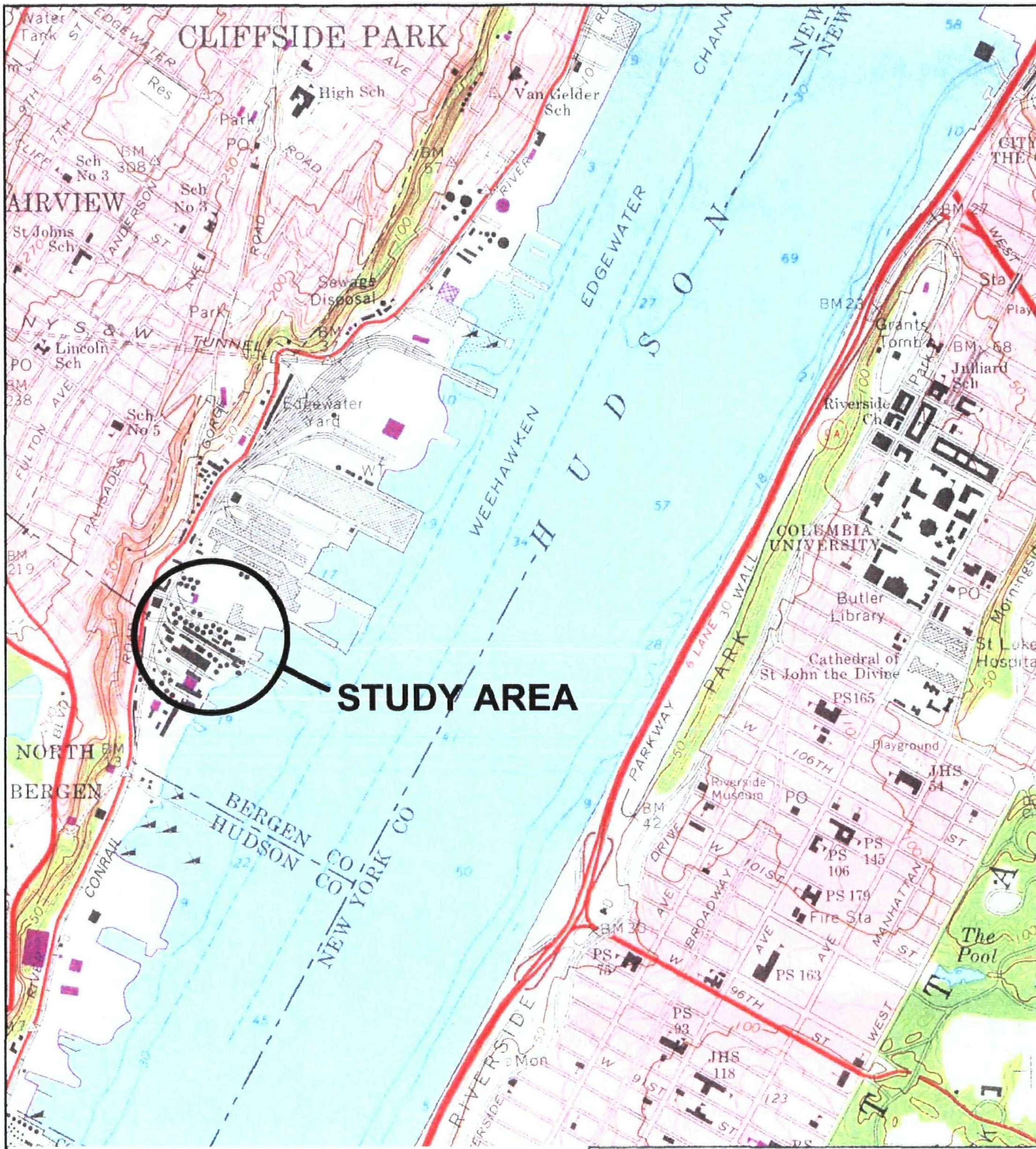
[1] The total PAHs concentration used for direct exposure is the sum of 10 indivdual PAHs for which the screening value (MHSPE 1994) was derived

TABLE 6-4
Bird and Mammal Ingestion Screening Statistics - COPC Refinement
Quanta Resources Site, New Jersey

Chemical	Short-tailed shrew		White-footed mouse		Meadow vole		Raccoon		Long-tailed weasel		American robin		Red-tailed hawk	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics														
Arsenic	**3.33E+00**	3.33E-01	4.06E-01	4.06E-02	3.10E-01	3.10E-02	--	--	--	--	6.86E-02	2.29E-02	--	--
Lead	6.48E-01	6.48E-02	8.09E-02	<1.00E-02	5.45E-02	<1.00E-02	4.14E-02	<1.00E-02	--	--	5.44E-01	5.44E-02	9.88E-02	<1.00E-02
Pesticides/PCBs														
4,4'-DDE	4.78E-01	9.56E-02	--	--	--	--	--	--	--	--	3.06E-01	3.06E-02	1.82E-01	1.82E-02
Aldrin	2.99E-01	5.97E-02	--	--	--	--	--	--	--	--	3.39E-01	3.39E-02	--	--
Aroclor-1016	**7.45E+00**	7.45E-01	**1.06E+00**	1.06E-01	--	--	3.02E-02	1.21E-02	1.05E-02	<1.00E-02	4.92E-01	4.92E-02	4.70E-02	<1.00E-02
Aroclor-1221	**7.25E+00**	7.25E-01	**1.04E+00**	1.04E-01	--	--	5.84E-01	5.84E-02	2.03E-01	2.03E-02	4.79E-01	4.79E-02	4.58E-02	<1.00E-02
Aroclor-1232	**7.32E+00**	7.32E-01	**1.05E+00**	1.05E-01	--	--	5.90E-01	5.90E-02	2.05E-01	2.05E-02	4.84E-01	4.84E-02	4.62E-02	<1.00E-02
Aroclor-1242	**7.50E+00**	7.50E-01	**1.07E+00**	1.07E-01	--	--	6.04E-01	6.04E-02	--	--	4.95E-01	4.95E-02	--	--
Aroclor-1248	**1.40E+01**	**1.40E+00**	**2.00E+00**	2.00E-01	5.03E-02	<1.00E-02	5.58E-01	1.13E-01	1.93E-01	3.92E-02	9.28E-01	9.28E-02	8.85E-02	<1.00E-02
Aroclor-1254	**7.49E+00**	7.49E-01	**1.07E+00**	1.07E-01	--	--	--	--	--	--	--	--	--	--
Aroclor-1260	**1.46E+01**	**1.46E+00**	**2.09E+00**	2.09E-01	--	--	5.82E-01	1.18E-01	--	--	9.68E-01	9.68E-02	--	--
Dieldrin	**1.45E+01**	**1.45E+00**	**2.20E+00**	2.20E-01	4.77E-01	4.77E-02	**1.81E+00**	1.81E-01	5.86E-01	5.86E-02	**1.60E+00**	1.60E-01	1.48E-01	1.48E-02
Endrin	**1.45E+00**	1.45E-01	2.06E-01	2.06E-02	--	--	--	--	--	--	**5.31E+00**	5.31E-01	5.07E-01	5.07E-02
Heptachlor	8.39E-01	8.39E-02	1.18E-01	1.18E-02	--	--	--	--	--	--	--	--	--	--
Heptachlor epoxide	**2.27E+00**	2.27E-01	3.28E-01	3.28E-02	--	--	--	--	--	--	2.15E-01	2.15E-02	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	3.09E-01	6.18E-02	--	--
SVOCs														
Benzo(a)anthracene	**4.78E+00**	4.78E-01	5.40E-01	5.40E-02	2.37E-01	2.37E-02	2.69E-01	2.69E-02	2.23E-01	2.23E-02	2.50E-01	2.50E-02	--	--
Benzo(a)pyrene	**5.73E+00**	5.73E-01	8.66E-01	8.66E-02	9.89E-01	9.89E-02	4.48E-01	4.48E-02	2.73E-01	2.73E-02	3.84E-01	3.84E-02	--	--
Benzo(b)fluoranthene	**5.23E+00**	5.23E-01	**1.26E+00**	1.26E-01	**3.00E+00**	3.00E-01	6.42E-01	6.42E-02	3.41E-01	3.41E-02	5.66E-01	5.66E-02	--	--
Benzo(g,h,i)perylene	**2.03E+00**	2.03E-01	**1.15E+00**	1.15E-01	**3.84E+00**	3.84E-01	5.99E-01	5.99E-02	2.19E-01	2.19E-02	5.08E-01	5.08E-02	--	--
Benzo(k)fluoranthene	**2.20E+00**	2.20E-01	2.90E-01	2.90E-02	3.31E-01	3.31E-02	--	--	--	--	--	--	--	--
Chrysene	**7.06E+00**	7.06E-01	8.65E-01	8.65E-02	2.49E-01	2.49E-02	4.55E-01	4.55E-02	2.89E-01	2.89E-02	3.77E-01	3.77E-02	--	--
Dibenz(a,h)anthracene	**1.33E+00**	1.33E-01	2.06E-01	2.06E-02	1.99E-01	1.99E-02	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--	--	--	**1.45E+00**	1.45E-01	--	--
Hexachlorobenzene	5.35E-01	2.68E-01	--	--	--	--	--	--	--	--	**1.86E+00**	3.72E-01	1.81E-01	3.63E-02
Hexachlorobutadiene	1.67E-01	1.67E-02	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	**3.51E+00**	3.51E-01	5.27E-01	5.27E-02	5.22E-01	5.22E-02	2.77E-01	2.77E-02	1.58E-01	1.58E-02	2.30E-01	2.30E-02	--	--
Pentachlorophenol	**1.84E+00**	1.84E-01	2.64E-01	2.64E-02	--	--	1.51E-01	1.51E-02	5.18E-02	<1.00E-02	4.31E-01	2.16E-01	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	6.68E-01	6.68E-02	--	--
Pyrene	**1.13E+01**	**1.13E+00**	**3.72E+00**	3.72E-01	**9.62E+00**	9.62E-01	**1.97E+00**	1.97E-01	7.43E-01	7.43E-02	**1.61E+00**	1.61E-01	--	--
Total PAHs [1]	**7.72E+01**	**7.72E+00**	**1.15E+01**	**1.15E+00**	**1.26E+01**	**1.26E+00**	**5.95E+00**	5.95E-01	**3.65E+00**	3.65E-01	**5.11E+00**	5.11E-01	4.74E-01	4.74E-02

[1] The total PAHs concentrations used for ingestion exposure is the sum of indivdual PAHs considered bioaccumulative (USEPA 2000)
NA = Not applicable because no screening value was available and a hazard quotient could not be calculated
-- = Hazard quotient not calculated because chemical not retained as Step 2 COPC for receptor

Figures



Map Source:
Central Park, NY-NJ,
U.S.G.S.
7.5 Min. Quad

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Figure 1-1
Study Area Location Map

Quanta Resources Site
Edgewater, New Jersey

February 7, 2006 | Fig1-01.mxd

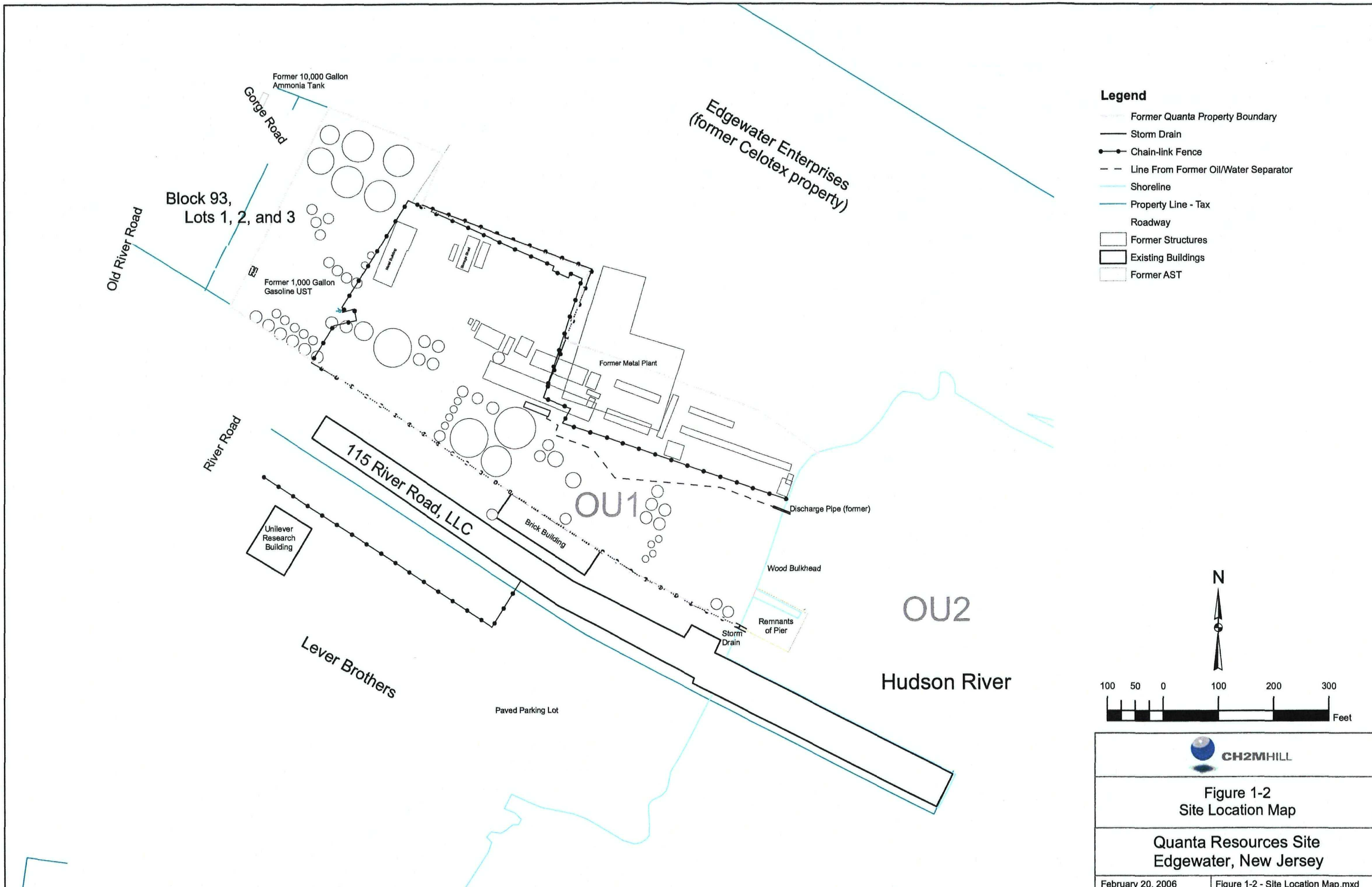


Figure 1-2
Site Location Map

Quanta Resources Site
Edgewater, New Jersey

February 20, 2006 | Figure 1-2 - Site Location Map.mxd

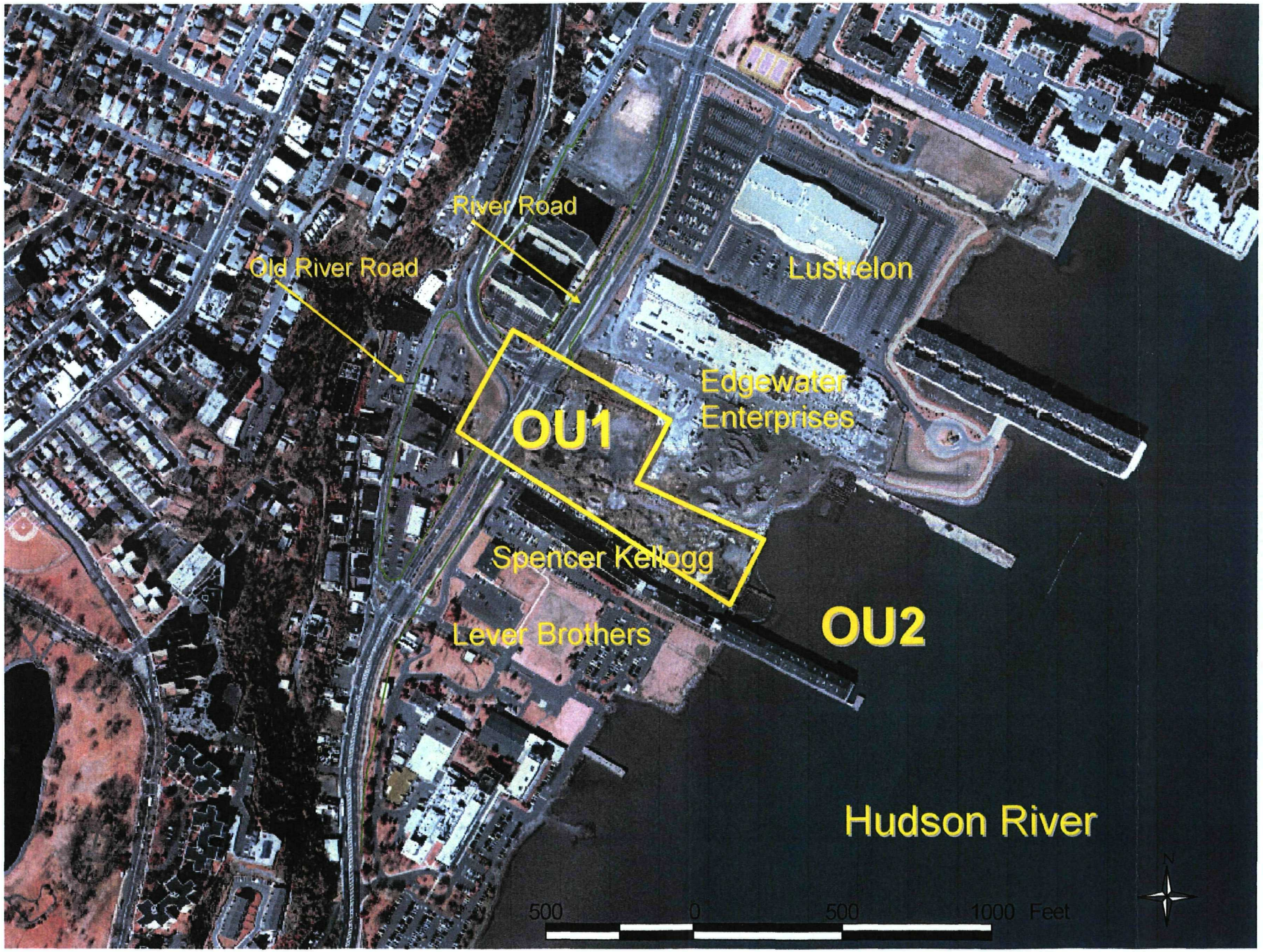


FIGURE 2-1
Aerial View of Site
Quanta Resources Site
Edgewater, New Jersey

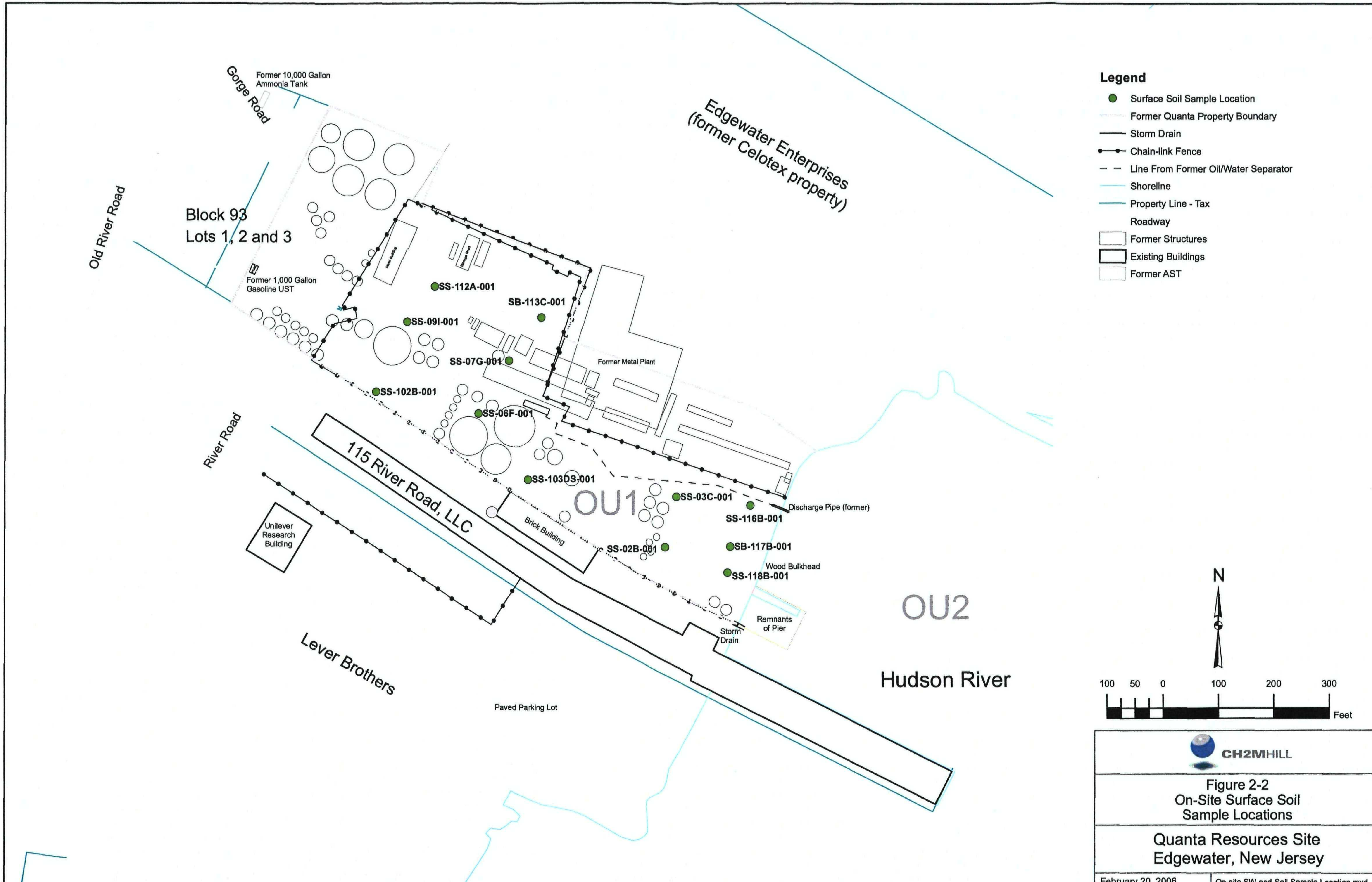
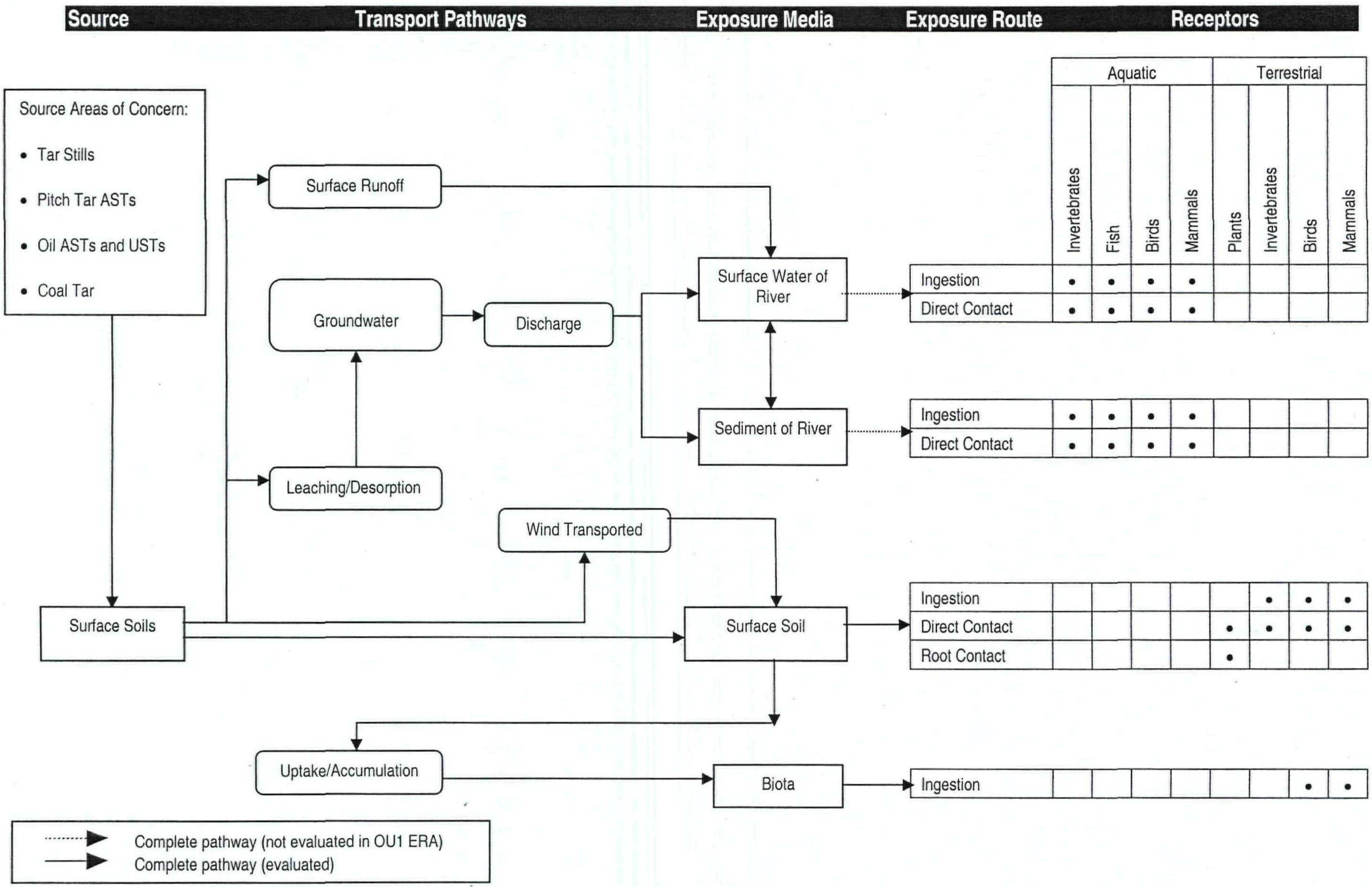


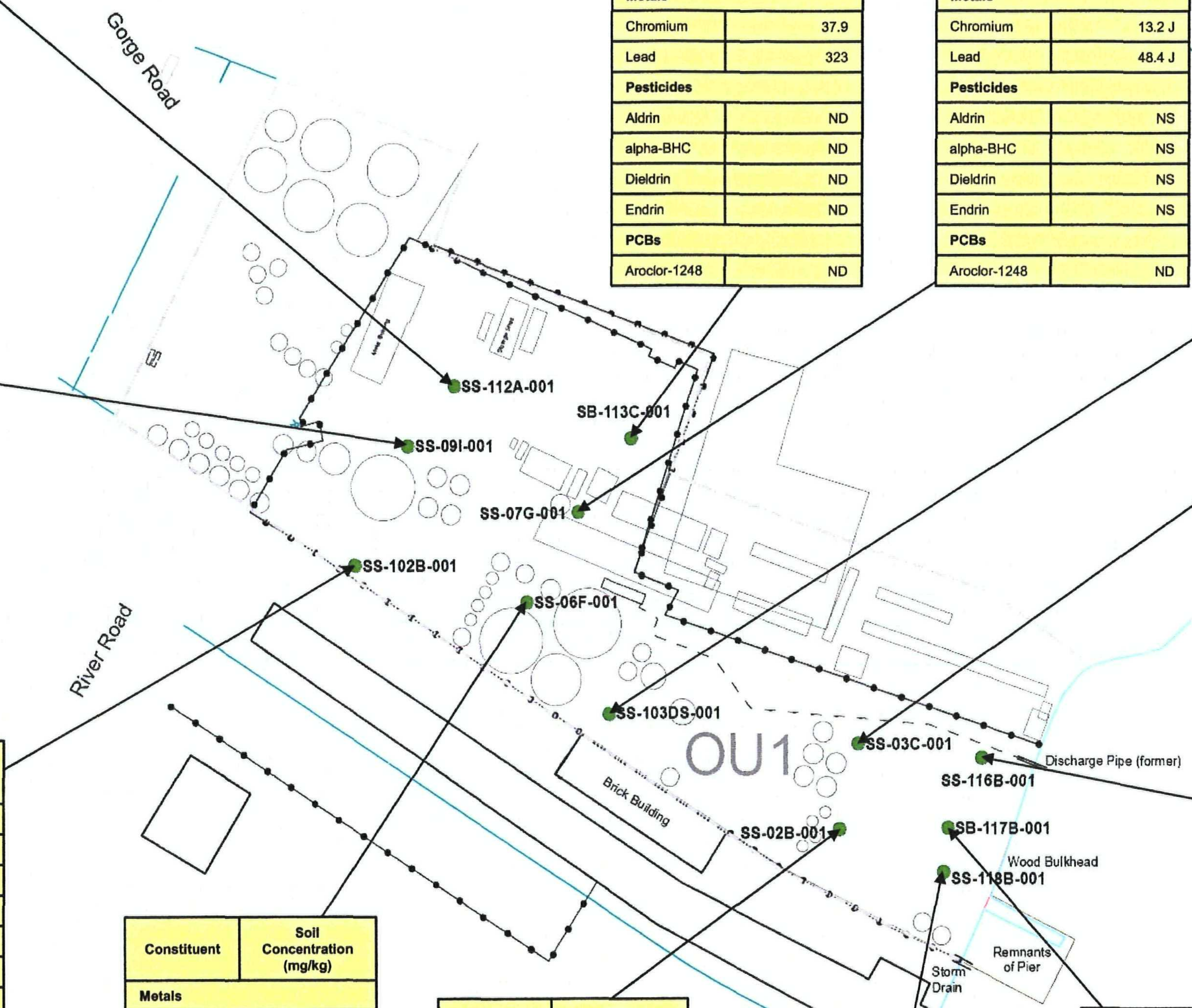
Figure 2-2
On-Site Surface Soil
Sample Locations

Quanta Resources Site
Edgewater, New Jersey

February 20, 2006 | On-site SW and Soil Sample Location.mxd

Figure 2-3
Ecological Conceptual Model for OU1
Quanta Resources Site, New Jersey





Constituent	Soil Concentration (mg/kg)
Metals	
Chromium	18.8
Lead	52.8
Pesticides	
Aldrin	ND
alpha-BHC	ND
Dieldrin	ND
Endrin	ND
PCBs	
Aroclor-1248	ND

Constituent	Soil Concentration (mg/kg)
Metals	
Chromium	37.9
Lead	323
Pesticides	
Aldrin	ND
alpha-BHC	ND
Dieldrin	ND
Endrin	ND
PCBs	
Aroclor-1248	ND

Constituent	Soil Concentration (mg/kg)
Metals	
Chromium	13.2 J
Lead	48.4 J
Pesticides	
Aldrin	NS
alpha-BHC	NS
Dieldrin	NS
Endrin	NS
PCBs	
Aroclor-1248	ND

Constituent	Soil Concentration (mg/kg)
Metals	
Chromium	11.7
Lead	22.8
Pesticides	
Aldrin	ND
alpha-BHC	ND
Dieldrin	ND
Endrin	ND
PCBs	
Aroclor-1248	ND

Legend

- Surface Soil Sample Location
- Former Quanta Property Boundary
- Storm Drain
- Chain-link Fence
- Line From Former Oil/Water Separator
- Shoreline
- Property Line - Tax
- Roadway
- Former Structures
- Existing Buildings
- Former AST

Notes:

NS – Not sampled

ND – Not detected

Constituent	Soil Concentration (mg/kg)
Metals	
Chromium	18
Lead	238
Pesticides	
Aldrin	NS
alpha-BHC	NS
Dieldrin	NS
Endrin	NS
PCBs	
Aroclor-1248	ND

Constituent	Soil Concentration (mg/kg)
Metals	
Chromium	13.4
Lead	96.4
Pesticides	
Aldrin	NS
alpha-BHC	NS
Dieldrin	NS
Endrin	NS
PCBs	
Aroclor-1248	ND

Constituent	Soil Concentration (mg/kg)
Metals	
Chromium	32
Lead	255
Pesticides	
Aldrin	NS
alpha-BHC	NS
Dieldrin	NS
Endrin	NS
PCBs	
Aroclor-1248	ND

Constituent	Soil Concentration (mg/kg)
Metals	
Chromium	31.5
Lead	408
Pesticides	
Aldrin	NS
alpha-BHC	NS
Dieldrin	NS
Endrin	NS
PCBs	
Aroclor-1248	ND

Constituent	Soil Concentration (mg/kg)
Metals	
Chromium	20
Lead	25.5
Pesticides	
Aldrin	NS
alpha-BHC	NS
Dieldrin	NS
Endrin	NS
PCBs	
Aroclor-1248	ND

Constituent	Soil Concentration (mg/kg)
Metals	
Chromium	18.6
Lead	118
Pesticides	
Aldrin	NS
alpha-BHC	NS
Dieldrin	NS
Endrin	NS
PCBs	
Aroclor-1248	ND

Constituent	Soil Concentration (mg/kg)
Metals	
Chromium	15.5
Lead	109
Pesticides	
Aldrin	NS
alpha-BHC	NS
Dieldrin	NS
Endrin	NS
PCBs	
Aroclor-1248	ND

Constituent	Soil Concentration (mg/kg)
Metals	
Chromium	17.6
Lead	120
Pesticides	
Aldrin	NS
alpha-BHC	NS
Dieldrin	NS
Endrin	NS
PCBs	
Aroclor-1248	ND

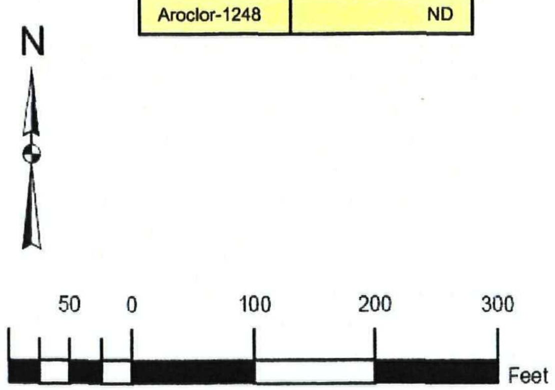


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Figure 6-1
Metals, Pesticides, and PCBs in Surface Soil

Quanta Resources Site
Edgewater, New Jersey

Constituent	Soil Concentration (mg/kg)
VOCs	
Benzene	1.8
Vinyl Chloride	ND
Xylene (Total)	9.4
SVOCs (no PAHs)	
2-Chlorophenol	ND
4-Nitrophenol	ND
Atrazine	ND
Diethylphthalate	ND
Dimethylphthalate	ND
Hexachlorobenzene	ND
Hexachlorocyclopentadiene	ND
Pentachlorophenol	ND

Constituent	Soil Concentration (mg/kg)
VOCs	
Benzene	0.0007 J
Vinyl Chloride	ND
Xylene (Total)	ND
SVOCs (no PAHs)	
2-Chlorophenol	ND
4-Nitrophenol	ND
Atrazine	ND
Diethylphthalate	ND
Dimethylphthalate	ND
Hexachlorobenzene	ND
Hexachlorocyclopentadiene	ND
Pentachlorophenol	ND

Constituent	Soil Concentration (mg/kg)
VOCs	
Benzene	0.0007 J
Vinyl Chloride	ND
Xylene (Total)	ND
SVOCs (no PAHs)	
2-Chlorophenol	ND
4-Nitrophenol	ND
Atrazine	ND
Diethylphthalate	ND
Dimethylphthalate	ND
Hexachlorobenzene	ND
Hexachlorocyclopentadiene	ND
Pentachlorophenol	ND

Constituent	Soil Concentration (mg/kg)
VOCs	
Benzene	ND
Vinyl Chloride	ND
Xylene (Total)	ND
SVOCs (no PAHs)	
2-Chlorophenol	ND
4-Nitrophenol	ND
Atrazine	ND
Diethylphthalate	ND
Dimethylphthalate	ND
Hexachlorobenzene	ND
Hexachlorocyclopentadiene	ND
Pentachlorophenol	ND

Legend

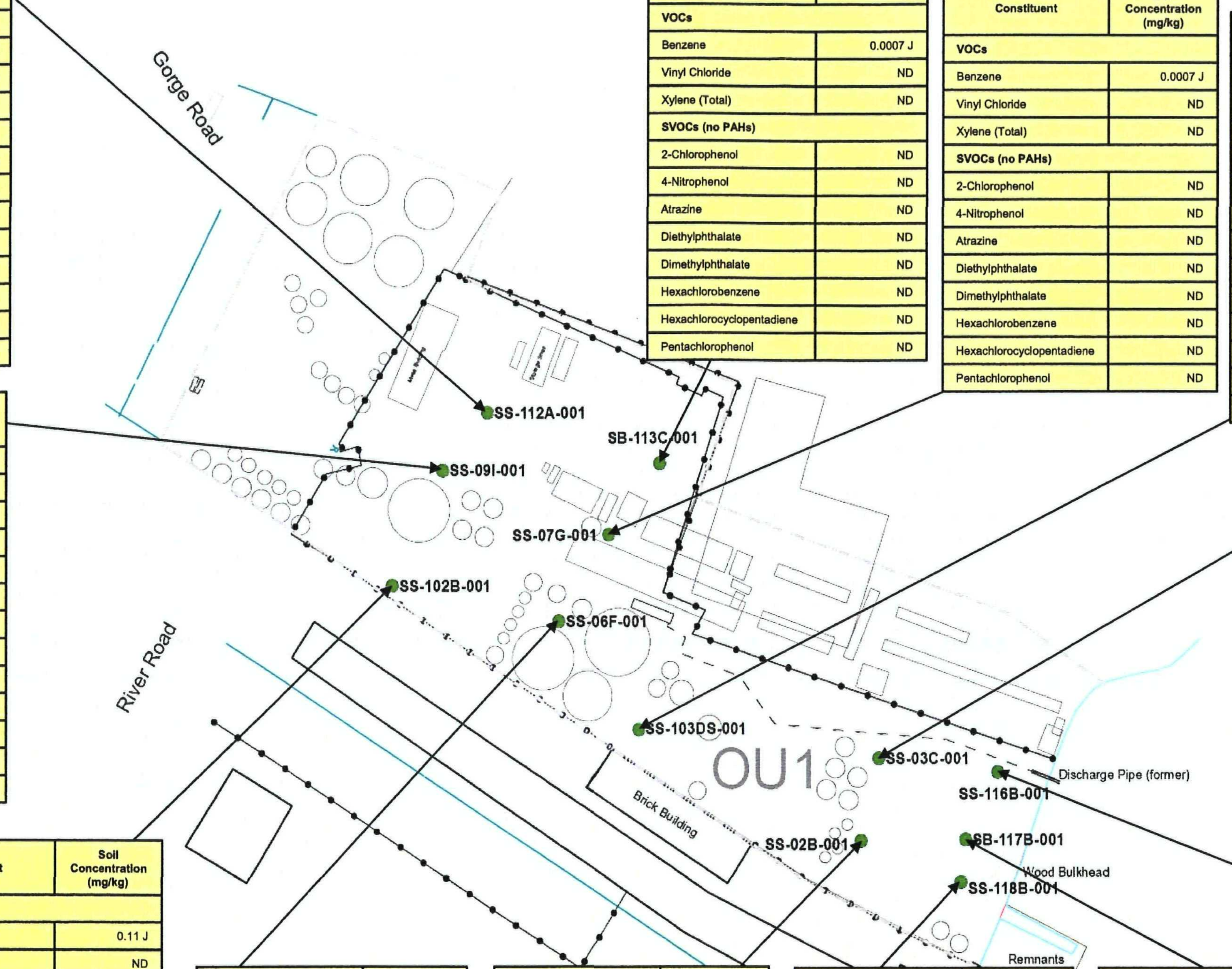
- Surface Soil Sample Location
- Former Quanta Property Boundary
- Storm Drain
- Chain-link Fence
- Line From Former Oil/Water Separator
- Shoreline
- Property Line - Tax
- Roadway
- Former Structures
- Existing Buildings
- Former AST

Notes:

NS – Not sampled

ND – Not detected

Constituent	Soil Concentration (mg/kg)
VOCs	
Benzene	0.002 J
Vinyl Chloride	ND
Xylene (Total)	0.001 J
SVOCs (no PAHs)	
2-Chlorophenol	ND
4-Nitrophenol	ND
Atrazine	ND
Diethylphthalate	ND
Dimethylphthalate	ND
Hexachlorobenzene	ND
Hexachlorocyclopentadiene	ND
Pentachlorophenol	ND



Constituent	Soil Concentration (mg/kg)
VOCs	
Benzene	2.1 J
Vinyl Chloride	ND
Xylene (Total)	21
SVOCs (no PAHs)	
2-Chlorophenol	ND
4-Nitrophenol	ND
Atrazine	ND
Diethylphthalate	ND
Dimethylphthalate	ND
Hexachlorobenzene	ND
Hexachlorocyclopentadiene	ND
Pentachlorophenol	ND

Constituent	Soil Concentration (mg/kg)
VOCs	
Benzene	0.022
Vinyl Chloride	ND
Xylene (Total)	0.008
SVOCs (no PAHs)	
2-Chlorophenol	ND
4-Nitrophenol	ND
Atrazine	ND
Diethylphthalate	ND
Dimethylphthalate	ND
Hexachlorobenzene	ND
Hexachlorocyclopentadiene	ND
Pentachlorophenol	ND

Constituent	Soil Concentration (mg/kg)
VOCs	
Benzene	0.11 J
Vinyl Chloride	ND
Xylene (Total)	8.4
SVOCs (no PAHs)	
2-Chlorophenol	ND
4-Nitrophenol	ND
Atrazine	ND
Diethylphthalate	ND
Dimethylphthalate	ND
Hexachlorobenzene	ND
Hexachlorocyclopentadiene	ND
Pentachlorophenol	ND

Constituent	Soil Concentration (mg/kg)
VOCs	
Benzene	ND
Vinyl Chloride	ND
Xylene (Total)	ND
SVOCs (no PAHs)	
2-Chlorophenol	ND
4-Nitrophenol	ND
Atrazine	ND
Diethylphthalate	ND
Dimethylphthalate	ND
Hexachlorobenzene	ND
Hexachlorocyclopentadiene	ND
Pentachlorophenol	ND

Constituent	Soil Concentration (mg/kg)
VOCs	
Benzene	0.069 J
Vinyl Chloride	ND
Xylene (Total)	0.13 J
SVOCs (no PAHs)	
2-Chlorophenol	ND
4-Nitrophenol	ND
Atrazine	ND
Diethylphthalate	ND
Dimethylphthalate	ND
Hexachlorobenzene	ND
Hexachlorocyclopentadiene	ND
Pentachlorophenol	ND

Constituent	Soil Concentration (mg/kg)
VOCs	
Benzene	0.003 J
Vinyl Chloride	ND
Xylene (Total)	0.014
SVOCs (no PAHs)	
2-Chlorophenol	ND
4-Nitrophenol	ND
Atrazine	ND
Diethylphthalate	ND
Dimethylphthalate	ND
Hexachlorobenzene	ND
Hexachlorocyclopentadiene	ND
Pentachlorophenol	ND

Constituent	Soil Concentration (mg/kg)
VOCs	
Benzene	ND
Vinyl Chloride	ND
Xylene (Total)	0.13 J
SVOCs (no PAHs)	
2-Chlorophenol	ND
4-Nitrophenol	ND
Atrazine	ND
Diethylphthalate	ND
Dimethylphthalate	ND
Hexachlorobenzene	ND
Hexachlorocyclopentadiene	ND
Pentachlorophenol	ND

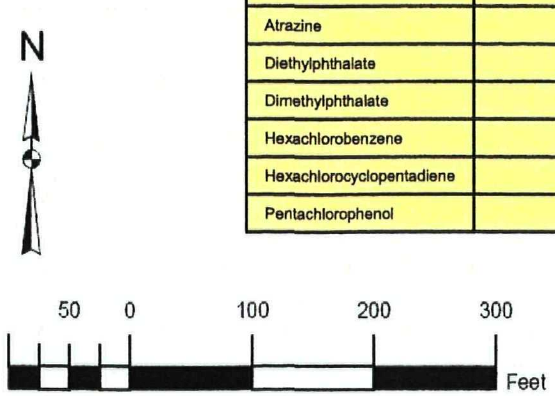


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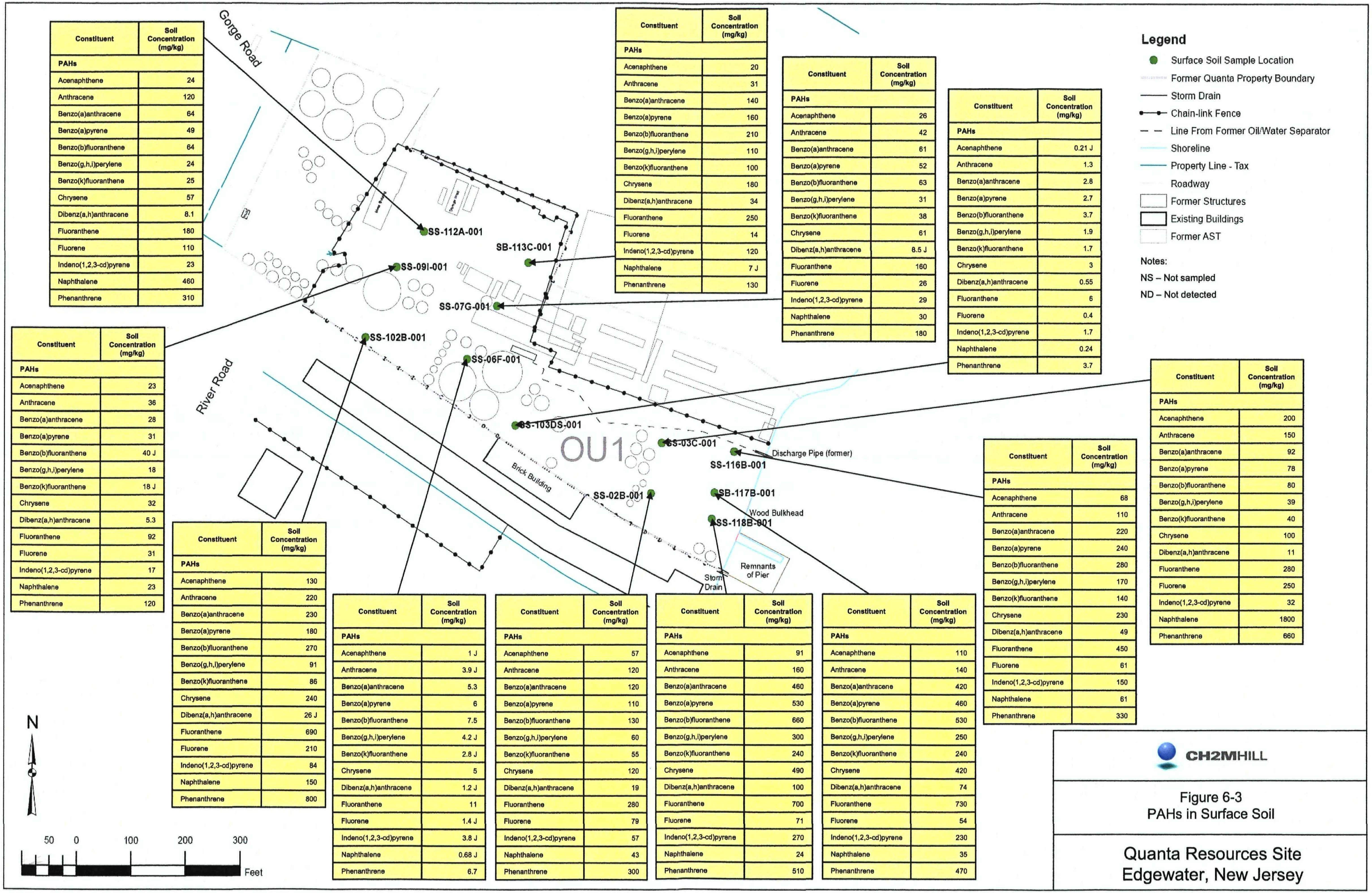
Figure 6-2
VOCs and Non-PAH SVOCs in Surface Soil

Quanta Resources Site
Edgewater, New Jersey



Constituent	Soil Concentration (mg/kg)
PAHs	
Acenaphthene	24
Anthracene	120
Benzo(a)anthracene	64
Benzo(a)pyrene	49
Benzo(b)fluoranthene	64
Benzo(g,h,i)perylene	24
Benzo(k)fluoranthene	25
Chrysene	57
Dibenz(a,h)anthracene	8.1
Fluoranthene	180
Fluorene	110
Indeno(1,2,3-cd)pyrene	23
Naphthalene	460
Phenanthrene	310

Constituent	Soil Concentration (mg/kg)
PAHs	
Acenaphthene	20
Anthracene	31
Benzo(a)anthracene	140
Benzo(a)pyrene	160
Benzo(b)fluoranthene	210
Benzo(g,h,i)perylene	110
Benzo(k)fluoranthene	100
Chrysene	180
Dibenz(a,h)anthracene	34
Fluoranthene	250
Fluorene	14
Indeno(1,2,3-cd)pyrene	120
Naphthalene	7 J
Phenanthrene	130

Constituent	Soil Concentration (mg/kg)
PAHs	
Acenaphthene	26
Anthracene	42
Benzo(a)anthracene	61
Benzo(a)pyrene	52
Benzo(b)fluoranthene	63
Benzo(g,h,i)perylene	31
Benzo(k)fluoranthene	38
Chrysene	61
Dibenz(a,h)anthracene	8.5 J
Fluoranthene	160
Fluorene	26
Indeno(1,2,3-cd)pyrene	29
Naphthalene	30
Phenanthrene	180

Constituent	Soil Concentration (mg/kg)
PAHs	
Acenaphthene	0.21 J
Anthracene	1.3
Benzo(a)anthracene	2.8
Benzo(a)pyrene	2.7
Benzo(b)fluoranthene	3.7
Benzo(g,h,i)perylene	1.9
Benzo(k)fluoranthene	1.7
Chrysene	3
Dibenz(a,h)anthracene	0.55
Fluoranthene	6
Fluorene	0.4
Indeno(1,2,3-cd)pyrene	1.7
Naphthalene	0.24
Phenanthrene	3.7

Constituent	Soil Concentration (mg/kg)
PAHs	
Acenaphthene	23
Anthracene	36
Benzo(a)anthracene	28
Benzo(a)pyrene	31
Benzo(b)fluoranthene	40 J
Benzo(g,h,i)perylene	18
Benzo(k)fluoranthene	18 J
Chrysene	32
Dibenz(a,h)anthracene	5.3
Fluoranthene	92
Fluorene	31
Indeno(1,2,3-cd)pyrene	17
Naphthalene	23
Phenanthrene	120

Constituent	Soil Concentration (mg/kg)
PAHs	
Acenaphthene	200
Anthracene	150
Benzo(a)anthracene	92
Benzo(a)pyrene	78
Benzo(b)fluoranthene	80
Benzo(g,h,i)perylene	39
Benzo(k)fluoranthene	40
Chrysene	100
Dibenz(a,h)anthracene	11
Fluoranthene	280
Fluorene	250
Indeno(1,2,3-cd)pyrene	32
Naphthalene	1800
Phenanthrene	660

Constituent	Soil Concentration (mg/kg)
PAHs	
Acenaphthene	68
Anthracene	110
Benzo(a)anthracene	220
Benzo(a)pyrene	240
Benzo(b)fluoranthene	280
Benzo(g,h,i)perylene	170
Benzo(k)fluoranthene	140
Chrysene	230
Dibenz(a,h)anthracene	49
Fluoranthene	450
Fluorene	61
Indeno(1,2,3-cd)pyrene	150
Naphthalene	61
Phenanthrene	330

Constituent	Soil Concentration (mg/kg)
PAHs	
Acenaphthene	130
Anthracene	220
Benzo(a)anthracene	230
Benzo(a)pyrene	180
Benzo(b)fluoranthene	270
Benzo(g,h,i)perylene	91
Benzo(k)fluoranthene	86
Chrysene	240
Dibenz(a,h)anthracene	26 J
Fluoranthene	690
Fluorene	210
Indeno(1,2,3-cd)pyrene	84
Naphthalene	150
Phenanthrene	800

Constituent	Soil Concentration (mg/kg)
PAHs	
Acenaphthene	1 J
Anthracene	3.9 J
Benzo(a)anthracene	5.3
Benzo(a)pyrene	6
Benzo(b)fluoranthene	7.5
Benzo(g,h,i)perylene	4.2 J
Benzo(k)fluoranthene	2.8 J
Chrysene	5
Dibenz(a,h)anthracene	1.2 J
Fluoranthene	11
Fluorene	1.4 J
Indeno(1,2,3-cd)pyrene	3.8 J
Naphthalene	0.68 J
Phenanthrene	6.7

Constituent	Soil Concentration (mg/kg)
PAHs	
Acenaphthene	57
Anthracene	120
Benzo(a)anthracene	120
Benzo(a)pyrene	110
Benzo(b)fluoranthene	130
Benzo(g,h,i)perylene	60
Benzo(k)fluoranthene	55
Chrysene	120
Dibenz(a,h)anthracene	19
Fluoranthene	280
Fluorene	79
Indeno(1,2,3-cd)pyrene	57
Naphthalene	43
Phenanthrene	300

Constituent	Soil Concentration (mg/kg)
PAHs	
Acenaphthene	91
Anthracene	160
Benzo(a)anthracene	460
Benzo(a)pyrene	530
Benzo(b)fluoranthene	660
Benzo(g,h,i)perylene	300
Benzo(k)fluoranthene	240
Chrysene	490
Dibenz(a,h)anthracene	100
Fluoranthene	700
Fluorene	71
Indeno(1,2,3-cd)pyrene	270
Naphthalene	24
Phenanthrene	510

Constituent	Soil Concentration (mg/kg)
PAHs	
Acenaphthene	110
Anthracene	140
Benzo(a)anthracene	420
Benzo(a)pyrene	460
Benzo(b)fluoranthene	530
Benzo(g,h,i)perylene	250
Benzo(k)fluoranthene	240
Chrysene	420
Dibenz(a,h)anthracene	74
Fluoranthene	730
Fluorene	54
Indeno(1,2,3-cd)pyrene	230
Naphthalene	35
Phenanthrene	470

CH2MHILL

Figure 6-3
PAHs in Surface Soil

Quanta Resources Site
Edgewater, New Jersey

Appendix A
Correspondence

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JON S. CORZINE
Governor

Division of Parks and Forestry
Office of Natural Lands Management
Natural Heritage Program
P.O. Box 404
Trenton, NJ 08625-0404
Tel. #609-984-1339
Fax. #609-984-1427

LISA P. JACKSON
Acting Commissioner

February 7, 2006

Andrew Hopton
CH2M Hill
1700 Market Street, Suite 1600
Philadelphia, PA 19103-3916

Re: Quanta Resources Corporation Superfund Site, CERCLIS ID NJ000606442

Dear Mr. Hopton:

Thank you for your data request regarding rare species information for the above referenced project site in Edgewater Borough, Bergen County.

Searches of the Natural Heritage Database and the Landscape Project (Version 2) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographic Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

Neither the Natural Heritage Database nor the Landscape Project has records for occurrences of any rare wildlife species on or within one mile of the referenced site.

We have also checked the Natural Heritage Database for occurrences of rare plant species or ecological communities. The Natural Heritage Database does not have any records for rare plants or ecological communities on or within one mile of the site.

Attached is a list of rare species and ecological communities that have been documented from Bergen County. If suitable habitat is present at the project site, these species have potential to be present.

Status and rank codes used in the tables and lists are defined in the attached EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS.

If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive I-Map-NJ website at the following URL, http://www.state.nj.us/dep/gis/depsplash.htm or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program.

PLEASE SEE THE ATTACHED 'CAUTIONS AND RESTRICTIONS ON NHP DATA'.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Herbert A. Lord

Herbert A. Lord
Data Request Specialist

cc: Robert J. Cartica
Lawrence Niles
NHP File No. 06-4007378

BERGEN COUNTY
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
*** Vertebrates						
ACCIPITER COOPERII	COOPER'S HAWK		T/T		G5	S3B,S4N
AMMODRAMUS SAVANNARUM	GRASSHOPPER SPARROW		T/S		G5	S2B
ASIO OTUS	LONG-EARED OWL		T/T		G5	S2B,S2N
BARTRAMIA LONGICAUDA	UPLAND SANDPIPER		E		G5	S1B
BUTEO LINEATUS	RED-SHOULDERED HAWK		E/T		G5	S1B,S2N
CIRCUS CYANEUS	NORTHERN HARRIER		E/U		G5	S1B,S3N
CISTOTHORUS PLATENSIS	SEDGE WREN		E		G5	S1B
CLEMMYS INSCULPTA	WOOD TURTLE		T		G4	S3
CLEMMYS MUHLENBERGII	BOG TURTLE	LT	E		G3	S2
CROTALUS HORRIDUS HORRIDUS	TIMBER RATTLESNAKE		E		G4T4	S2
EUMECES FASCIATUS	FIVE-LINED SKINK		U		G5	S3
FALCO PEREGRINUS	PEREGRINE FALCON		E		G4	S1B,S?N
FULICA AMERICANA	AMERICAN COOT		D		G5	S1B
HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	LT	E		G4	S1B,S2N
IXOBRYCHUS EXILIS	LEAST BITTERN		D/S		G5	S3B
LYNX RUFUS	BOBCAT		E		G5	S3
MELANERPES ERYTHROCEPHALUS	RED-HEADED WOODPECKER		T/T		G5	S2B,S2N
NEOTOMA MAGISTER	ALLEGHENY WOODRAT		E		G3G4	S1
NYCTANASSA VIOLACEA	YELLOW-CROWNED NIGHT-HERON		T/T		G5	S2B
NYCTICORAX NYCTICORAX	BLACK-CROWNED NIGHT-HERON		T/S		G5	S3B,S4N
PASSERCULUS SANDWICHENSIS	SAVANNAH SPARROW		T/T		G5	S2B,S4N
PODILYMBUS PODICEPS	PIED-BILLED GREBE		E/S		G5	S1B,S3N
POOECETES GRAMINEUS	VESPER SPARROW		E		G5	S1B,S2N
STERNA ANTILLARUM	LEAST TERN		E		G4	S1B
STRIX VARIA	BARRED OWL		T/T		G5	S3B
*** Invertebrates						
AESHNA CLEPSYDRA	MOTTLED DARNER				G4	S2S3
AESHNA TUBERCULIFERA	BLACK-TIPPED DARNER				G4	S1S2

BERGEN COUNTY

RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN

THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
ALASMIDONTA HETERODON	DWARF WEDGEMUSSEL	LE	E		G1G2	S1
ALASMIDONTA UNDULATA	TRIANGLE FLOATER		T		G4	S3
AMBLYSCIRTES HEGON	PEPPER AND SALT SKIPPER				G5	S1S2
ARIGOMPHUS FURCIFER	LILYPAD CLUBTAIL				G5	S2
CHLOSYNE HARRISII	HARRIS' CHECKERSPOT				G4	S2S3
CORDULEGASTER ERRONEA	TIGER SPIKETAIL				G4	S2
ENALLAGMA LATERALE	NEW ENGLAND BLUET				G3	S1S2
GOMPHUS ROGERSI	SABLE CLUBTAIL				G4	S1S2
LAMPSILIS RADIATA	EASTERN LAMPMUSSEL		T		G5	S3
LANTHUS VERNALIS	SOUTHERN PYGMY CLUBTAIL				G4	S2S3
LESTES EURINUS	AMBER-WINGED SPREADWING				G4	S2
LYCAENA HYLLUS	BRONZE COPPER		E		G5	S2
NICROPHORUS AMERICANUS	AMERICAN BURYING BEETLE	LE	E		G2G3	SH
POLITES MYSTIC	LONG DASH				G5	S3?
PONTIA PROTODICE	CHECKERED WHITE		T		G4	S1
PYRGUS WYANDOT	APPALACHIAN GRIZZLED SKIPPER		E		G2	SH
SATYRIUM ACADICUM	ACADIAN HAIRSTREAK				G5	S2S3
SPEYERIA APHRODITE	APHRODITE FRITILLARY				G5	S2S3
SPEYERIA IDALIA	REGAL FRITILLARY				G3	SH
TACHOPTERYX THOREYI	GRAY PETALTAIL				G4	S1
WILLIAMSONIA LINTNERI	RINGED BOGHAUNTER				G3	SH
** Nonvascular plants						
SPHAGNUM CONTORTUM	SPHAGNUM		E		G5	S1
SPHAGNUM MAJUS SSP NORVEGICUM	SPHAGNUM		E		G5?T?	S1.1
** Vascular plants						
ADLUMIA FUNGOSA	CLIMBING FUMITORY				G4	S2
AGASTACHE NEPETOIDES	YELLOW GIANT-HYSSOP				G5	S2
AGASTACHE SCROPHULARIIFOLIA	PURPLE GIANT-HYSSOP				G4	S2

BERGEN COUNTY
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
ALOPECURUS AEQUALIS VAR AEQUALIS	SHORT-AWN MEADOW-FOXTAIL				G5T?	S2
AMELANCHIER HUMILIS	LOW SERVICE-BERRY				G5	S1
AMMANNIA LATIFOLIA	KOEHN'S TOOTHCUP		E		G5	S1
ANEMONE CANADENSIS	CANADA ANEMONE				G5	SX
APLECTRUM HYEMALE	PUTTYROOT		E		G5	S1
ARABIS HIRSUTA VAR PYCNOCARPA	WESTERN HAIRY ROCKCRESS				G5T5	S2
ASCLEPIAS VERTICILLATA	WHORLED MILKWEED				G5	S2
ATHYRIUM PYCNOCARPON	GLADE FERN		E		G5	S1
BOTRYCHIUM ONEIDENSE	BLUNT-LOBE GRAPE FERN				G4Q	S2
BOUTELOUA CURTIPENDULA	SIDE-OATS GRAMA GRASS		E		G5T5	S1
CALLITRICHE PALUSTRIS	MARSH WATER-STARWORT				G5	S2
CAREX DISPERMA	SOFT-LEAF SEDGE				G5	S1
CAREX HAYDENII	CLOUD SEDGE		E		G5	S1
CAREX PSEUDOCYPERUS	CYPERUS-LIKE SEDGE		E		G5	S1
CAREX TUCKERMANII	TUCKERMAN'S SEDGE		E		G4	S1
CAREX UTRICULATA	BOTTLE-SHAPED SEDGE				G5	S2
CASTILLEJA COCCINEA	SCARLET INDIAN-PAINTBRUSH				G5	S2
CERCIS CANADENSIS	REDBUD		E		G5T5	S1
CHENOPODIUM SIMPLEX	MAPLE-LEAF GOOSEFOOT				G5	S2
CORALLORHIZA WISTERIANA	SPRING CORALROOT				G5	SX
COREOPSIS ROSEA	ROSE-COLOR COREOPSIS			LP	G3	S2
CRATAEGUS CHRYSOCARPA VAR CHRYSOCARPA	FIREBERRY HAWTHORN				G5T?	S1
CRYPTOGRAMMA STELLERI	SLENDER ROCKBRAKE		E		G5	SH.1
CYPRIPEDIUM REGINAE	SHOWY LADY'S-SLIPPER		E		G4	S1
DIRCA PALUSTRIS	LEATHERWOOD				G4	S2
DOELLINGERIA INFIRMA	CORNEL-LEAF ASTER				G5	S2
DRYOPTERIS CELSA	LOG FERN				G4	SX
EQUISETUM PRATENSE	MEADOW HORSETAIL		E		G5	S1

0 AUG 2004

BERGEN COUNTY

RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN

THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
ERIOPHORUM GRACILE	SLENDER COTTON-GRASS		E		G5T?	SH
GNAPHALIUM MACOUNII	WINGED CUDWEED		E		G5	SH
HEMICARPHA MICRANTHA	SMALL-FLOWER HALFCHAFF SEDGE		E		G4	S1
HOTTONIA INFLATA	FEATHERFOIL		E		G4	S1
HYPERICUM ADPRESSUM	BARTON'S ST. JOHN'S-WORT		E		G2G3	S2
HYPERICUM MAJUS	LARGER CANADIAN ST. JOHN'S WORT		E		G5	S1
ISOTRIA MEDEOLOIDES	SMALL WHORLED POGONIA	LT	E		G2	S1
LEMNA PERPUSILLA	MINUTE DUCKWEED		E		G5	S1
LEMNA VALDIVIANA	PALE DUCKWEED		E		G5	S1
LIMOSELLA SUBULATA	AWL-LEAF MUDWORT		E		G4G5	S1
LINUM SULCATUM	GROOVED YELLOW FLAX		E		G5T5	S1
LUZULA ACUMINATA	HAIRY WOOD-RUSH		E		G5T4T5	S2
MELANTHIUM VIRGINICUM	VIRGINIA BUNCHFLOWER		E		G5	S1
MIMULUS ALATUS	WINGED MONKEY-FLOWER				G5	S3
NUPHAR MICROPHYLLUM	SMALL YELLOW POND-LILY		E		G5T4T5	SH
PLATANTHERA HYPERBOREA VAR HYPERBOREA	LEAFY NORTHERN GREEN ORCHID				G5T5	SX
POA AUTUMNALIS	FLEXUOUS SPEAR GRASS		E		G5	SH.1
PRENANTHES RACEMOSA	SMOOTH RATTLESNAKE-ROOT		E		G5T?	SH
PYCNANTHEMUM TORREI	TORREY'S MOUNTAIN-MINT		E		G2	S1
SACCHARUM ALOPECUROIDUM	SILVER PLUME GRASS				G5	SH
SALIX LUCIDA SSP LUCIDA	SHINING WILLOW				G5T5	S1
SALIX PEDICELLARIS	BOG WILLOW		E		G5	S1
SCHOENOPLECTUS TORREYI	TORREY'S BULRUSH		E		G5?	S1
SCIRPUS MARITIMUS	SALTMARSH BULRUSH		E		G5	SH
SCLERIA PAUCIFLORA VAR CAROLINIANA	CAROLINA NUT-RUSH				G5T4T5	S2
SCLERIA VERTICILLATA	WHORLED NUT-RUSH		E		G5	S1
SCUTELLARIA LEONARDII	SMALL SKULLCAP		E		G4T4	S1

BERGEN COUNTY
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
SOLIDAGO RIGIDA	PRAIRIE GOLDENROD		E		G5T5	S1
STACHYS HYSSOPIFOLIA	HYSSOP HEDGE-NETTLE				G5	S2
THUJA OCCIDENTALIS	ARBORVITAE		E		G5	S1
TIARELLA CORDIFOLIA	FOAMFLOWER		E		G5T5	S1
TRIPHORA TRIANTHOPHORA	THREE BIRDS ORCHID		E		G3G4	S1
TROLLIUS LAXUS SSP LAXUS	SPREADING GLOBE FLOWER		E		G4T3	S1
VERBENA SIMPLEX	NARROW-LEAF VERVAIN		E		G5	S1
VIOLA CANADENSIS	CANADIAN VIOLET		E		G5T?	S1
VIOLA SEPTENTRIONALIS	NORTHERN BLUE VIOLET		E		G5	S1

117 Records Processed

EXPLANATIONS OF CODES USED IN NATURAL HERITAGE REPORTS

FEDERAL STATUS CODES

The following U.S. Fish and Wildlife Service categories and their definitions of endangered and threatened plants and animals have been modified from the U.S. Fish and Wildlife Service (F.R. Vol. 50 No. 188; Vol. 61, No. 40; F.R. 50 CFR Part 17). Federal Status codes reported for species follow the most recent listing.

LE	Taxa formally listed as endangered.
LT	Taxa formally listed as threatened.
PE	Taxa already proposed to be formally listed as endangered.
PT	Taxa already proposed to be formally listed as threatened.
C	Taxa for which the Service currently has on file sufficient information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened species.
S/A	Similarity of appearance species.

STATE STATUS CODES

Two animal lists provide state status codes after the Endangered and Nongame Species Conservation Act of 1973 (NSSA 23:2A-13 et. seq.): the list of endangered species (N.J.A.C. 7:25-4.13) and the list defining status of indigenous, nongame wildlife species of New Jersey (N.J.A.C. 7:25-4.17(a)). The status of animal species is determined by the Nongame and Endangered Species Program (ENSP). The state status codes and definitions provided reflect the most recent lists that were revised in the New Jersey Register, Monday, June 3, 1991.

D	Declining species-a species which has exhibited a continued decline in population numbers over the years.
E	Endangered species-an endangered species is one whose prospects for survival within the state are in immediate danger due to one or many factors - a loss of habitat, over exploitation, predation, competition, disease. An endangered species requires immediate assistance or extinction will probably follow.
EX	Extirpated species-a species that formerly occurred in New Jersey, but is not now known to exist within the state.
I	Introduced species-a species not native to New Jersey that could not have established itself here without the assistance of man.
INC	Increasing species-a species whose population has exhibited a significant increase, beyond the normal range of its life cycle, over a long term period.
T	Threatened species-a species that may become endangered if conditions surrounding the species begin to or continue to deteriorate.
P	Peripheral species-a species whose occurrence in New Jersey is at the extreme edge of its present natural range.
S	Stable species-a species whose population is not undergoing any long-term increase/decrease within its natural cycle.
U	Undetermined species-a species about which there is not enough information available to determine the status.

Status for animals separated by a slash(/) indicate a duel status. First status refers to the state breeding population, and the second status refers to the migratory or winter population.

Special Concern applies to animal species that warrant special attention because of some evidence of decline, inherent vulnerability to environmental deterioration, or habitat modification that would result in their becoming a Threatened species. This category would also be applied to species that meet the foregoing criteria and for which there is little understanding of their current population status in the state.

Plant taxa listed as endangered are from New Jersey's official Endangered Plant Species List N.J.S.A. 131B-15.151 et seq.

E Native New Jersey plant species whose survival in the State or nation is in jeopardy.

REGIONAL STATUS CODES FOR PLANTS AND ECOLOGICAL COMMUNITIES

LP Indicates taxa listed by the Pinelands Commission as endangered or threatened within their legal jurisdiction. Not all species currently tracked by the Pinelands Commission are tracked by the Natural Heritage Program. A complete list of endangered and threatened Pineland species is included in the New Jersey Pinelands Comprehensive Management Plan.

HL Indicates taxa or ecological communities protected by the Highlands Water Protection and Planning Act within the jurisdiction of the Highlands Preservation Area.

EXPLANATION OF GLOBAL AND STATE ELEMENT RANKS

The Nature Conservancy has developed a ranking system for use in identifying elements (rare species and natural communities) of natural diversity most endangered with extinction. Each element is ranked according to its global, national, and state (or subnational in other countries) rarity. These ranks are used to prioritize conservation work so that the most endangered elements receive attention first. Definitions for element ranks are after The Nature Conservancy (1982: Chapter 4, 4.1-1 through 4.4.1.3-3).

GLOBAL ELEMENT RANKS

G1 Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

G2 Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.

G3 Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single western state, a physiographic region in the East) or because of other factors making it vulnerable to extinction throughout it's range; with the number of occurrences in the range of 21 to 100.

G4 Apparently secure globally; although it may be quite rare in parts of its range, especially at the periphery.

G5 Demonstrably secure globally; although it may be quite rare in parts of its range, especially at the periphery.

GH Of historical occurrence throughout its range i.e., formerly part of the established biota, with the expectation that it may be rediscovered.

GU Possibly in peril range-wide but status uncertain; more information needed.

GX Believed to be extinct throughout range (e.g., passenger pigeon) with virtually no likelihood that it will be rediscovered.

G? Species has not yet been ranked.

GNR Species has not yet been ranked.

STATE ELEMENT RANKS

S1 Critically imperiled in New Jersey because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres). Elements so ranked are often restricted to very specialized conditions or habitats and/or restricted to an extremely small geographical area of the state. Also included are elements which were formerly more abundant, but because of habitat destruction or some other critical factor of its biology, they have been demonstrably reduced in abundance. In essence, these are elements for which, even with intensive searching, sizable additional occurrences are unlikely to be discovered.

S2 Imperiled in New Jersey because of rarity (6 to 20 occurrences). Historically many of these elements may have been more frequent but are now known from very few extant occurrences, primarily because of habitat destruction. Diligent searching may yield additional occurrences.

S3 Rare in state with 21 to 100 occurrences (plant species and ecological communities in this category have only 21 to 50 occurrences). Includes elements which are widely distributed in the state but with small populations/acreage or elements with restricted distribution, but locally abundant. Not yet imperiled in state but may soon be if current trends continue. Searching often yields additional occurrences.

S4 Apparently secure in state, with many occurrences.

S5 Demonstrably secure in state and essentially ineradicable under present conditions.

SA Accidental in state, including species (usually birds or butterflies) recorded once or twice or only at very great intervals, hundreds or even thousands of miles outside their usual range; a few of these species may even have bred on the one or two occasions they were recorded; examples include European strays or western birds on the East Coast and vice-versa.

SE Elements that are clearly exotic in New Jersey including those taxa not native to North America (introduced taxa) or taxa deliberately or accidentally introduced into the State from other parts of North America (adventive taxa). Taxa ranked SE are not a conservation priority (viable introduced occurrences of G1 or G2 elements may be exceptions).

SH Elements of historical occurrence in New Jersey. Despite some searching of historical occurrences and/or potential habitat, no extant occurrences are known. Since not all of the historical occurrences have been field surveyed, and unsearched potential habitat remains, historically ranked taxa are considered possibly extant, and remain a conservation priority for continued field work.

SP Element has potential to occur in New Jersey, but no occurrences have been reported.

SR Elements reported from New Jersey, but without persuasive documentation which would provide a basis for either accepting or rejecting the report. In some instances documentation may exist, but as of yet, its source or location has not been determined.

SRF Elements erroneously reported from New Jersey, but this error persists in the literature.

SU Elements believed to be in peril but the degree of rarity uncertain. Also included are rare taxa of uncertain taxonomical standing. More information is needed to resolve rank.

SX Elements that have been determined or are presumed to be extirpated from New Jersey. All historical occurrences have been searched and a reasonable search of potential habitat has been completed. Extirpated taxa are not a current conservation priority.

SXC Elements presumed extirpated from New Jersey, but native populations collected from the wild exist in cultivation.

SZ Not of practical conservation concern in New Jersey, because there are no definable occurrences, although the taxon is native and appears regularly in the state. An SZ rank will generally be used for long distance migrants whose occurrences during their migrations are too irregular (in terms of repeated visitation to the same locations), transitory, and dispersed to be reliably identified, mapped and protected. In other words, the migrant regularly passes through the state, but enduring, mappable element occurrences cannot be defined.

Typically, the SZ rank applies to a non-breeding population (N) in the state - for example, birds on migration. An SZ rank may in a few instances also apply to a breeding population (B), for example certain lepidoptera which regularly die out every year with no significant return migration.

Although the SZ rank typically applies to migrants, it should not be used indiscriminately. Just because a species is on migration does not mean it receives an SZ rank. SZ will only apply when the migrants occur in an irregular, transitory and dispersed manner.

B Refers to the breeding population of the element in the state.

N Refers to the non-breeding population of the element in the state.

T Element ranks containing a "T" indicate that the infraspecific taxon is being ranked differently than the full species. For example *Stachys palustris* var. *homotricha* is ranked "G5T? SH" meaning the full species is globally secure but the global rarity of the var. *homotricha* has not been determined; in New Jersey the variety is ranked historic.

Q Elements containing a "Q" in the global portion of its rank indicates that the taxon is of questionable, or uncertain taxonomical standing, e.g., some authors regard it as a full species, while others treat it at the subspecific level.

.1 Elements documented from a single location.

Note: To express uncertainty, the most likely rank is assigned and a question mark added (e.g., G2?). A range is indicated by combining two ranks (e.g., G1G2, S1S3).

IDENTIFICATION CODES

These codes refer to whether the identification of the species or community has been checked by a reliable individual and is indicative of significant habitat.

Y Identification has been verified and is indicative of significant habitat.

BLANK Identification has not been verified but there is no reason to believe it is not indicative of significant habitat.

? Either it has not been determined if the record is indicative of significant habitat or the identification of the species or community may be confusing or disputed.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New Jersey Field Office
Ecological Service
927 North Main Street, Building D
Pleasantville, New Jersey 08232
Tel: 609-646-9310
Fax: 609-646-0352
http://njfieldoffice.fws.gov

IN REPLY REFER TO:
ES-06/NE 23

JAN 26 2006

CH2M Hill

Phila, PA

Attn: Andrew Hopton

Fax number: 267 675-4512

Threatened and endangered species review for:

Project identification: Honeywell International - Quanta Resources Corp. Superfund Site

Township: Edgewater County: Bergen, New Jersey

The U.S. Fish and Wildlife Service (Service) has reviewed the above-referenced proposed project pursuant to Section 7 of the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) (ESA) to ensure the protection of federally listed endangered and threatened species. The following comments do not address all Service concerns for fish and wildlife resources and do not preclude separate review and comment by the Service as afforded by other applicable environmental legislation.

Except for an occasional transient bald eagle (*Haliaeetus leucocephalus*), no other federally listed or proposed endangered or threatened flora or fauna under Service jurisdiction are known to occur within the vicinity of the proposed project site. Therefore, no further consultation pursuant to Section 7 of the Endangered Species Act is required by the Service. This determination is based on the best available information. If additional information on federally listed species becomes available, or if project plans change, this determination may be reconsidered.

Please refer to this office's web site at http://www.fws.gov/northeast/njfieldoffice/Endangered/eslist.htm for a current list of federally listed species or candidate species in New Jersey. Candidate species are species under consideration by the Service for federal listing. Although candidate species receive no substantive or procedural protection under the ESA, the Service encourages you to consider candidate species in project planning. The above web site also provides contacts for obtaining the most up-to-date information on federal candidate species and State-listed plant species in New Jersey from the New Jersey Natural Heritage Program and information on State-listed wildlife species from the New Jersey Endangered and Nongame Species Program. If information from either of these sources reveals the presence of any federal candidate species within your project area, the Service should be contacted at the above address immediately to ensure that these species are not adversely affected by project activities.

Authorizing Supervisor: [signature]

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Habitat Conservation Division
James J. Howard Marine
Sciences Laboratory
74 Magruder Road
Highlands, New Jersey 07732

January 26, 2006

TO: Andrew Hopton
CH2M HILL
1700 Market Street, Suite 1600
Philadelphia, PA 19103-3916

SUBJECT: Honeywell International Inc.
Quanta Resources Corporation Superfund Site
Edgewater, Bergen Co., NJ

KHG Karen Greene
(Reviewing Biologist)

We have reviewed the information provided to us regarding the above subject project. We offer the following preliminary comments pursuant to the Endangered Species Act, the Fish and Wildlife Coordination Act and the Magnuson-Stevens Fishery Conservation and Management Act:

Endangered and Threatened Species

____ There are no endangered or threatened species in the project area.

__X__ Endangered shortnose sturgeon (*Acipenser brevirostrum*) may be present in the project area, please contact Endangered Species Coordinator, NOAA Fisheries Service's Protected Resources Division , One Blackburn Drive, Gloucester, MA 01930-2298 for additional information.

Fish and Wildlife Coordination Act

The following may be present in the project area: Anadromous and resident fish, forage and benthic species including striped bass, Atlantic tomcod, winter flounder, windowpane and summer flounder.

DEPENDING UPON THE PROJECT DETAILS POSSIBLE RECOMMENDATIONS INCLUDE:

Insufficient information on the proposed construction activities provided.

Essential Fish Habitat

____ No EFH presently designated in the project area.

_X_ The project area has been designated as Essential Fish Habitat (EFH) for one or more species. An EFH consultation by the federal action agency will be required. For a listing of EFH and further information, please go to our website at:

http://www.nero.noaa.gov/hcd
-If you wish to discuss this further, please call 732-872-3023-